RADIOGRAPHIC EVALUATION OF MENTAL FORAMEN IN HOSPITAL BASED POPULATION

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CERTIFICATE

This is to certify that this dissertation titled **"Radiographic Evaluation of Mental Foramen in Hospital Based Population"** is a bonafide record of work done by **Dr.R.Malavika** under my guidance during her postgraduate study period **2009-2012.**

This dissertation is submitted to **THE TAMILNADU Dr. M.G.R. MEDICAL UNIVERSITY,** in partial fulfillment for the degree of **MASTER OF DENTAL SURGERY, BRANCH IX – Oral Medicine and Radiology.**

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LIST OF ABBREVIATIONS

S.NO	ABBREVIATION	EXPANSION
1.	MF	Mental Foramen
2.	MS	Mandibular Symphisis
3.	SON	Supra orbital Notch
4.	SOF	Supra orbital foramen
5.	IOF	Infra orbital foramen
6.	OPT	Orthopantamogram
7.	CT	Computed Tomography
8.	ICC	Inter Class Coeffecient
9.	mA	Mili ampere
10.	kVp	Kilo voltage potential
11.	SPSS	Statistical Package for Social Science
12.	CAD	Computer Aided Design

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Mental foramen (MF) is a small foramen which is usually round in shape measuring 2.57 to 2.8 mm [1]. It is situated in antero lateral aspect of the body of the mandible. It transmits mental nerve, artery and vein .The mental foramen marks the termination of the mandibular canal in the mandible, through which the inferior alveolar nerve and vessels pass. At this point, the mandibular canal bifurcates and forms the mental and incisive canals. The mental bundle passes through the mental foramen and supplies sensory innervation and blood supply to the soft tissues of the chin, lower lip and gingiva on the ipsilateral side of the mandible [2]

The accurate identification of the mental foramen is important for both diagnostic and clinical procedures. The radiographic appearance of the mental foramen may result in a misdiagnosis of a radiolucent lesion in the apical area of mandibular premolar teeth. Clinically; the mental bundle could be injured during surgical procedures like periapical surgeries, implant placements, orthognathic surgeries resulting in paraesthesia or anesthesia. There are no absolute anatomical landmarks for reference and the foramen cannot be clinically visualized or palpated. As a result, the reported anatomical position of the mental foramen has been variable[2]

The most useful injection for anesthetising the mandibular teeth is the inferior alveolar nerve block. It is necessary to administer a nerve block in the lower jaw because of the thickness of the dense mandibular cortical bone which prevents adequate diffusion of the solution. To anesthetise the anterior teeth, including the premolars and canines, it is possible to avoid

giving inferior alveolar block, by injecting anesthetic solution adjacent to the mental foramen. Although this is termed mental injection or mental nerve block, the aim of the injection is to affect the inferior alveolar and incisive nerves in that region. Studying the position and its morphological variations of MF is very important because it will be helpful to localize the important maxillofacial neurovascular bundle passing through the mental foramen [3]

In planning of oral implants, information on the quantity and quality of bone available is acquired mainly from the radiographic examination. An important aspect to consider is the localization of anatomical landmarks in the area of the potential implant since this determines its dimensions and the axes.Localisation of important anatomical structures is related among other factors to the image quality, in particular the accuracy and precision of the chosen technique. Location of Mental foramen also plays an important role in determining the site, size, direction of placement of implants[4]

According to Yosue and Brooks[5], the radiographic appearance of the mental foramen can be classified into four types: in the first the mental canal is continuous with the mandibular canal; the second is the separated type, where the foramen is distinctly separated from the mandibular canal; a third is said to be diffuse with a distinct border of the foramen, while the fourth group is the so-called `unidentified type[5]

The size, position and symmetry of the mental foramen presents with many variations as influenced by age, sex, race and hence it is important to

study these variations in mental foramen so as to apply it in surgical and anesthetic interventions[6]. With this background a Orthopantomographic study was planned to determine the size, position, symmetry and abnormalities of the mental foramen with respect to the age and sex of a hospital based population.

AIM OF THE STUDY:

To evaluate and locate the position, symmetry, shape, size and abnormalities of the mental foramen using orthopantomograms in a hospital based population

OBJECTIVES OF THE STUDY:

1. To locate the position of the right and left metal foramen with respect to the apex of the primary or permanent dentition
2. To compare the symmetry of the right and left mental foramens
3. To measure the size of the right and left mental foramen
4. To evaluate the shape of the right and left mental foramen
5. To evaluate any abnormalities of the mental foramen
6. To evaluate any age wise variations in position, measurement and shape of mental foramen
7. To evaluate any gender differences in position, measurement and shape of mental foramen

The Study of radiographic evaluation of Mental Foramen is done with the aid of Panoromic Radiograph as the panoramic machine covers the entire mandible. Panoromic radiography is curved plane tomographic radiographic technique used to depict the body of the mandible, maxilla, and the lower one half of the maxillary sinuses on a single image and they can be used in evaluating the position of the mental foramen. Panoramic radiographs are useful to skeleton and dental diseases evaluations, making possible a bi dimensional analysis and showing the relative angulations from teeth to other structures. The advantages of this technique are: lower radiation dose, simple procedure, faster images achievement and full visualization of the jaws in just one radiographic procedure. The disadvantages are the lower definition degree and detail, presence of distortions and the overlap of anatomic structures.[4]

Mental foramen (MF) is a small foramen which is usually round in shape measuring 2.57 to 2.8 mm[1]. The identification and actual location of the mental foramen is of great importance in clinical dentistry for instance in the administration of local anaesthesia for surgical, operative or diagnostic purposes and in endodontic treatment. Anatomically, there is one mental foramen on each side of the mandible through which passes the mental artery and vein and the mental nerves, the larger of the two terminal branches of the inferior alveolar nerve. The number of mental nerves can vary in individuals and in different races, between one and three. The

existence of multiple mental foramina has been described, but some of these are considered possibly the mental-incisive foramen complex. On rare occasions, the mental foramen may be absent[7]

Variations

The mental foramen (MF) is usually located below the interval between the premolar teeth, or the second premolar, from which emerge the mental nerve and vessels. However, variations in the location of the foramen have been reported with respect to age sex and race among others. It may occur between the apices of the lower premolars, below the apex of the second premolar and below the apex of the lower second premolar. It is suggested that there are repeated failures to locate the mental foramen for injections and other operative procedures. In children before tooth eruption, MF is closer to the superior margin of the body of the mandible and during the eruption period, MF descends to halfway between the superior and inferior margins of the body of the mandible, and in adults with the teeth preserved, the MF is closer to the inferior border of the body of the mandible. With loss of teeth and the alveolar bone resorption the MF moves upwards closer to the superior border of the mandible and in extreme cases of resorption the MF and the adjacent part of the mandibular canal are open at the superior margin of the body of the mandible[3]

On the other hand, data from various ethnic groups, for example Tanzanian Thai , Chinese , British , Indian , Kenyan African and Saudi Arabian , vary concerning the location of the MF. There is clear racial trend

in the position of the MF. All the variations suggest the possibility of local differences in a population. A study including Central Anatolian individuals from Turkish population has already been reported. A new series of variations of the MF from Eastern Anatolian individuals in the Turkish population is presented and the possibility of local variation of the MF is investigated[8]

Gintaras Juodzbalys et al[9] reviewed the literature of how to identify the mental foramen, mandibular incisive canal and associated neurovascular bundles during implant surgery and how to detect and avoid the damage of these vital structures during implant therapy. Literature was selected through a search of PubMed, Embase and Cochrane electronic databases. The keywords used for search were mandibular incisive canal, mental foramen, mental nerve, anterior mental loop. The search was restricted to English language articles, published from 1979 to November 2009. Additionally, a manual search in the major anatomy, dental implant, and periodontal journals and books was performed. In total, 47 literature sources were obtained and reviewed. The morphology and variations of the mandibular incisive canal, mental foramen and associated neurovascular bundles were presented as two entities. It suggested that clinicians should carefully assess these vital structures to avoid nerve/artery damage. The mandibular incisive canal, mental foramen and associated neurovascular bundles exist in different locations and possess many variations. Individual, gender, age, race, assessing technique used and degree of edentulous

alveolar bone atrophy largely influence these variations. It suggests that the clinicians should carefully identify these anatomical landmarks, by analyzing all influencing factors, prior to their implant surgical operation.

Previous studies on the Assessment of Mental Foramen

The summary of studies on the various variations of the location of mental foramen has been summarized as review of literature

A.STUDIES ON THE POSITION OF FORAMEN BASED ON POPULATION

1. INDIAN POPULATION

Rajani Singh et al[1] conducted a study using dried adult Indian human mandibles of both sexes. Size and position were determined using digital vernier callipers. Incidences and shapes of mental foramen and accessory mental foramen were also observed. Mental foramen was present in all one hundred observed mandibles and it is bilateral. Accessory mental foramen was present in 8 percent on left side while on right side, it was 5 percent. None of the mandibles presented with bilateral accessory mental foramen. Shape was predominantly round with 94 percent on right side and 87 percent on left side while it was oval in 6 percent on right side and 13 percent on left side. Average size of mental foramen was 2.79 mm on right side while it was 2.57 mm on left side. Average size of accessory mental foramen was 1.00 mm varying from 0.5 mm to 4.00 mm. mental foramen was located below the apex of second premolar in 68.8 percent mandibles while it is 17.8 percent between first and second premolars and in 11.5

percent, it is between second premolar and first molar. Accessory mental foramen lies0.67 mm lateral to mental foramen and below the apex of first molar tooth.

Abu Ubaida Siddiqui et al[10] assessed various parameters pertaining to the morphology and morphometry of the mental foramen in 93 dry Indian human mandibles. Measurements were taken as the distance between alveolar margin and MF, distance between MF and base of the mandible, distance between symphysis menti and MF and distance between MF and posterior border of the ramus of the mandible. The study also included the relation of MF with the lower teeth (the position of the MF was recorded as lying in line with the long axis of a tooth or interdental space in one of the six types, 1 to 6. The most common shape of the foramen was oval (70%). The most common position of the MF as related to the lower set of teeth was in line with the second premolar. The mean distance between symphysis menti and anterior margin of MF was 18.8mm and 19.6mm , on the right and left sides respectively. Mean distance between posterior margin of MF and posterior border of ramus was 48.8 mm on the right side and 47.9 mm on the left side. Mean distance between alveolar crest and superior margin of MF was 10.2 mm on right side and 10 mm on the left side. Mean distance between inferior margin of MF and lower border of the body of mandible was 9.9 mm on the right side and 10.1 mm on the left side. The study carries clinical credibility in ascertaining the accurate

location of the MF and thus avoiding any unforeseen injury related to anaesthesia or dental surgeries

2. IRANIAN POPULATION

Sina Haghanifar et al[11] determined the most common location of the mental foramen in an Iranian population. They also analyzed gender differences and the symmetry of location within individuals. 400 panoramic radiographs were evaluated with regard to the location and symmetry of the mental foramina in male and female subjects. They found that the mental foramen was located between the first and second premolars in 47.2% of patients and in line with the second premolar in 46%. In 49.2% of males, the mental foramen was in line with the second premolar. In 50.9% of females it was between the first and second premolars. It was symmetrical in 85.7%. Based on this study it appears that the most common position of mental foramen is either between the two premolars or in line with the second premolar. This is in concordance with previous studies

3. THAI POPULATION

W. Apinhasmit et al[12] studied Sixty-nine adult mandibles (45 male, 24 female) of Thai dry skulls were assessed to determine the size, the orientation and the location of the mental foramen (MF) related to gender and side. The results showed that the usual direction of exit of the MF was in a postero superior direction. The most common location of the MF was bilaterally symmetrical and located on the same vertical line with the long axis of the lower second premolar. The mean distances from the MF to the

symphysis menti, to the posterior border of the mandibular ramus, to the lower border of the mandible and to the buccal cusp tip of the second premolar were 28.83, 68.85, 14.88 and 24.27 mm, respectively. The mean distances from the alveolar bone crest across the MF to the lower border of the mandible was 29.97 mm. The mean distance from the buccal cusp tip of the second premolar through the long axis of the clinical crown to the lower border of the mandible was 39.18 mm. No measurements varied according to the sides. In contrast, gender differences were significant in all measurements with the longer distances in males. The values of the three ratios were nearly equal in males and females. These results may assist surgeons to localize important maxillofacial neurovascular bundles passing through the MF in avoiding complication from local anesthetic, surgical and other invasive procedures.

4. BRAZILLIAN POPULATION

Maise Mendonça Amorim[13] reported variation in position in different ethnic groups. Repeated failures during injections and operative procedures involving the mental foramen suggest the presence of local differences in a given population. The aim of the present study was to determine the position of mental foramen (MF) in a sample of one hundred seventy Brazilian adult dry mandible, being 79 edentulous and 91 dentate. The assessment was made, having as it referential, the base of the mandible and the mandibular symphisis, whereby the comparisons were carried out considering genders, the mandible side (left or right), and dentition (dentate

or edentulous). It was found the male mandibles presented higher values than the female ones and the dentate presented higher values when compared to edentulous ones. No difference was observed between left and right sides, as well, as concerning to gender. The most frequent position of MF was in the long axes of the second premolar for male and female. No statistical difference was found between right and left sides comparing male to female. It was concluded the position of the mental foramen is mainly altered in edentulous subjects as it is considered a symmetric structure in Brazilian population and its most common position is in the long axes of the second premolar

5. LOCAL MALYAS AND INDIANS IN SINGAPORE

Jennifer Neo[14] The position of the mental foramen of the local Malays and Indians in Singapore was determined from a series of orthopantomograms. The position of the foramen was recorded in relation to adjacent mandibular teeth, as (1) at the apex of the first premolar; (2) in between the apices of the first and second premolar; (3) at the apex of the second premolar; (4) in between the apices of the second premolar and the first molar; or (5) at the mesial half of the first molar. The results demonstrate the mental foramen to be most commonly located below the apex of the second premolar for the right and left sides of both the Singaporean Malays and Indians. This data has implications in the teaching and practice of dental anesthesia. In both these races, the median location is just below the second premolar

6. BLACK TANZANIAN POPULATION

Flora M. Fabian [15] aimed at documenting the location, shape, and direction of the opening of the mental foramen in dry mandibles of adult black Tanzanian population. A hundred mandibles were available for studying. In 45% the mental foramen was located below the apex of the second premolar, 35% between the second premolar and the first molar, 12% between the first premolar and second premolar and 8% below the first molar. The mental foramen was asymmetrically located between the right and left sides in 78% of the mandibles. The shape of the mental foramen was oval in 54% and rounded in 46% of the mandibles observed. The direction of opening was superiorly in 44%, postero-superiorly in 40%, labially in 10%, mesially (anteriorly) in 3%, and posteriorly in 3%. Unilateral double mental foramen was observed in 3% of the mandibles. In conclusion these results showed that the mental foramen in the dry mandibles of adult black male Tanzanians was located mostly below the apices of the second premolar or more posteriorly (80%) while only a small percentage was located between the first and second premolars. This is different from previous reports. In more than half the shape was oval and it was rounded in less than half of the mandibles. The opening was mainly superiorly and postero-superiorly, with a small percentage opening labially, mesially (anteriorly) and posteriorly.

7. MALAY POPULATION

Wei Cheong Ngeow et al[2] determined the position of the mental foramen in a selected Malay population. One hundred and sixty nine panoramic radiographs of Malay patients retrieved from a minor oral surgery waiting list were selected to identify the normal range for the position of the mental foramen. The foramen was not included in the study if there was any mandibular tooth missing between the lower left and right first molars (36-46). The findings indicated the most common position for the mental foramen was in line with the longitudinal axis of the second premolar (69.2%) followed by a location between the first and second premolar (19.6%). The right and left foramina were bilaterally symmetrical in three of six recorded positions in 67.7% patients. The mental foramen was most often in line with the second premolar

8. TURKISH POPULATION

YeÕilyurt et al[8] was to investigated possible local differences of the mental foramen in Eastern Anatolian individuals in the Turkish population. The present investigation is based on the examination of 70 adult mandibles. The study consisted of three measurements, to include the relations of the mental foramen to the following: 1) the lower teeth; 2) the body of mandible; 3) the mandibular symphysis and posterior border of the ramus of the mandible. The most common position of the foramen was in line with the longitudinal axis of the second premolar tooth, at the midpoint of the mandibular body height and at 1/3.5 of the distance from the mandibular

symphysis to the posterior border of the ramus. Local differences of the mental foramen may occur in a population. Prior to surgery knowledge of the most common location of the foramen peculiar to a local population may enable effective mental block anaesthesia to be provided.

KahramanGungor et al[16] investigated the most common position of the mental foramen in a selected Turkish population. The study sample included three hundred and sixty one panoramic radiographs of selected Turkish population taken in Faculty of Dentistry, University of Gazi. The most common position of the mental foramen was between the first premolar and the second premolar (71.5%). The mental foramen was symmetrical in 90.4% of patients. In this study, the difference of the location of the mental foramen in different ethnics groups was discussed. Clinicians and anthropologists should expect to find the position of the mental foramen to be symmetrical and between the first premolar and the second premolar teeth

9. SAUDI POPULATION

NM Al Jasser et al[7] determined the most common position of the mental foramen in a selected Saudi population and to compare the results with those reported for other populations. Four hundred and fourteen panoramic radiographs of a Saudi population from four different dental centers were studied. The commonest position of the mental foramen was in line with the longitudinal axis of the second premolar (45.3%) followed closely by location between the first and second premolars (42.7%). The

mental foramen was symmetrical in 80% of patients. Clinicians should expect to find the position of the mental foramen to be symmetrical and in line with the second premolar teeth.

B. STUDIES ON THE POSITION OF MENTAL FORAMEN WITH VARIATIONS ON AGE

1. Sidney Ricardo Dotto et al[4] evaluated the location of the mental foramen, using panoramic x-rays from children with ages among ten to 12 years. In a first moment, the radiographs were digitalized and measures were accomplished in the Image Tool 1.27 software, being verified the distance between the mandible border and the mental foramen inferior portion, the total height of the alveolar ridge, and also the distance between the medium portion of the mental foramen and a traced line of the nasal spine previously to a point located in the most inferior portion of the mentus. In children with ages among ten and 11 years, the percentage occurrence of the mental foramen location was in the inferior third of the alveolar ridge and, in the 12 years age group, it was in the middle third. Authors concluded that the position of the mental foramen modifies with the increase of the age, being important the analysis of the precisely location of the mental foramen in Pediatric Dentistry

Evelise ONO et al[17] evaluated the anteroposterior position of the MF, and verified the possible changes on its location on 7 to 12 year-old children. Ninety panoramic radiographs from the Dentomaxillofacial Radiology department at the Dentistry School of São José dos Campos –

São Paulo State University – were examined. The shortest anteroposterior length of the mandibular ramus and the distance between the point correspondent to the MF to the deepest portion of the anterior border of the mandibular ramus were obtained using a digital caliper. All the measurements were registered in millimeters. The ratio between the measurements was calculated. The descriptive statistic analysis and the 95% confidence interval ANOVA (one-way) test were applied. The results showed that the anteroposterior location of the MF is, on average, at the medium third of the mandibular ramus. No statistically significant differences were found between ages.

Balwant Rai[18] evaluated the possible radiographical marker in edentulous mandible to determine the age and gender from different parameters of radiographs. Study was conducted on 103 orthopantomograms of edentulous patients, aged (55-76 years). All radiolucencies or radioopacities in premolar to posterior alveolar ridge were observed. Different parameters such as; height of mandibular body, distance between lower mandible border to superior margin of mental foramina. The distance between the superior margin of mental foramina to crest of the alveolar ridge and from the lower border to crest of alveolar ridge. Identification markers were found in 23.8 percent cases. Age was directly related to alveolar ridge in both males and females. Distance between crest of alveolar ridge and superior margin of mental foramina may be used for gender and sex determination.

C. VARIATIONS ON METHODOLOGY OF ASSESSMENT

1. Assessment of Mental Foramen on Dry skulls

W. Apinhasmit et al[12] studied Sixty-nine adult mandibles (45 male, 24 female) of Thai dry skulls which were assessed to determine the size, the orientation and the location of the mental foramen (MF) related to gender and side. The results showed that the usual direction of exit of the MF was in a postero superior direction. The most common location of the MF was bilaterally symmetrical and located on the same vertical line with the long axis of the lower second premolar. The mean distances from the MF to the symphysis menti, to the posterior border of the mandibular ramus, to the lower border of the mandible and to the buccal cusp tip of the second premolar were 28.83, 68.85, 14.88 and 24.27 mm, respectively. The mean distances from the alveolar bone crest across the MF to the lower border of the mandible was 29.97 mm. The mean distance from the buccal cusp tip of the second premolar through the long axis of the clinical crown to the lower border of the mandible was 39.18 mm. No measurements varied according to the sides. In contrast, gender differences were significant in all measurements with the longer distances in males. The values of the three ratios were nearly equal in males and females. These results may assist surgeons to localize important maxillofacial neurovascular bundles passing through the MF in avoiding complication from local anesthetic, surgical and other invasive procedures.

Maise Mendonça Amorim[13] determined the position of mental foramen (MF) in a sample of one hundred seventy Brazilian adult dry mandible, being 79 edentulous and 91 dentate. The assessment was made, having as it referential, the base of the mandible and the mandibular symphisis, whereby the comparisons were carried out considering genders, the mandible side (left or right), and dentition (dentate or edentulous).It was found the male mandibles presented higher values of MF-MS than the female ones and the dentate presented higher values when compared to edentulous ones . No difference was observed between left and right sides , as well, as concerning to gender . The most frequent position of MF was in the long axes of the second premolar for male and female No statistical difference was found between right and left sides comparing male to female. It was concluded the position of the mental foramen is mainly altered in edentulous subjects as it is consider a symmetric structure in Brazilian population and its most common position is in the long axes of the second premolar.

LBL Prabodha et al[3] carried out a study in the Department of Anatomy Faculty of Medicine, University of Ruhuna. 24 hemimandibles were examined and out of which there were 15 Male and 09 Female subjects. The age ranged from 47 years to 103 years. Measurements were obtained by using a vernier caliper. Distance from (a) Symphysis menti, (b) Inferior border of the mandible, (c) Posterior border of the ramus and (d) Superior border of the body of the mandible to the MF and the diameters of

the MF were taken in to the nearest 1/10 of the millimeter. Following results were obtained .Mean age was 74.73 years in males and 75.43 years in females. Out of 24 hemi-mandibles 22 (91.67%) posses single MF and Two (8.33%) had accessory MF's. The accessory MF's were smaller in size (mean diameter 1.70 mm) than the regular MF (Mean diameter 2.11 mm in round shape and mean long diameter was 2.97 mm in oval shape MF) and were oval in shape. The mean distance from symphysis menti, posterior border of the ramus, and inferior border of the body of the mandible were 26.52 mm, 65.38 mm, 12.25 mm respectively. The authors concluded that there was no significant difference in the shape, position and age related variation of the MF with similar studies, but a significant difference can be seen in the size of the MF in Sri Lankan mandibles.

W. Apinhasmit et al[12] determined the morphology and the locations of the Supra Orbital Notch/Foramen (SON/F), Infra Orbital Foramen (IOF), and Mental Foramen (MF) relative to frequently encountered surgical landmarks. One hundred and six Thai adult skulls were investigated. Mean horizontal width of MF was 2.80 _ 0.70 mm, respectively. The MF was a mean of 28.52 _ 2.15 mm lateral to the symphysis menti and most commonly observed in line with the second lower premolar. Its usual direction of opening was in a postero-superior direction. The results of the present study may assist surgeons to localize important maxillofacial neurovascular bundles passing through these foramina in facilitating surgical, local anesthetic and other invasive procedures

2. Use of Panoromic Radiographs to assess Mental Foramen

EdelaPuricelli [19] Orthopantomography (panoramic radiography) has been used for the study of measurements involving particularly the prediction of the eruption of impacted lower third molars and analyses of measurements of the ramus and head of mandible. The discrepancies involved with the projection of this radiographic image has stimulated the search for further ways to use it, particularly in orthodontic treatments and oral and maxillofacial surgeries. The author proposes a graphimetric method for the mandible, based on panoramic radiography. The results are expressed in linear and angular measurements, aiming at bilateral comparisons as well as the determination of the proportion of skeletal and dental structures, individually and among themselves as a whole. The method has been named Panorametry, and allows measurement of the mandible (Mandibular Panorametry) or the posterior mandibular teeth (Dental Panorametry). When combining mandible and maxilla, it should be referred to as Total Panorametry.

Jacobs et al[20] Studied the visibility of neurovascular structures in the mandibular interforaminal region on such radiographs. Panoramic radiographs were obtained with a Cranex Tome (Soredex) from 545 consecutive patients using a standard exposure and positioning protocol. For visibility scoring of neurovascular structures, a four-point rating scale was used. The mandibular canal and the mental foramen could be observed in the majority of the cases with good visibility. An incisive canal was

identified in 15% of the images, with good visibility in only 1%. An anatomical variation to be considered is the anterior looping of the mental nerve (in 11% of images). Panoramic radiographs can be used for visualization of the mental foramen and a potential anterior looping but not for locating the mandibular incisive canal. To verify its existence for preoperative planning purposes, cross sectional imaging modalities (HR-CT or spiral tomography) should be preferred.

Nazar Al Talabani[21] developed and characterized a computer-based application to locate the position of the mental foramen (MF) on **orthopantomograms** of both dentulous and edentulous patients. Panoramic radiographs were analyzed using the computer programs Photoshop and AutoCAD to locate the MF in the horizontal and vertical planes in 110 dentulous patients and in the superior/inferior planes of 50 completely edentulous patients. In the 110 dentulous populations , the anteroposterior position of the MF was primarily defined by being in line with either the longitudinal axis of the lower second premolar or the longitudinal axis of a point between the first and second premolars . The anteroposterior position of the MF was asymmetrical in 17.3% of the patients (10.3% of men and 25% of women). In the vertical plane, the MF was located slightly below the midpoint between the inferior border of the mandible and the alveolar bone crest. No significant differences related to side was detected. It was concluded that this convenient, computer-based application facilitates the rapid pin-pointing of the MF on panoramic radiographs. In the present

study, the MF was located directly below the mandibular second premolar in the majority of Kurdish patients. These results and techniques may be useful when any mandibular surgery is planned.

Wei Cheong Ngeow et al [2] studied on the anterior loop of the mental foramen using panoramic radiographs. The anterior loop is defined as where the mental neurovascular bundle crosses anterior to the mental foramen then doubles back to exit the mental foramen. It cannot be seen clinically but can be detected in 11-60% of panoramic radiographs. As this anatomical structure is important in determining the placement position of endosseous implants in the mandibular premolar region, a pilot study was undertaken to determine its visibility on dental panoramic radiographs in dentate subjects of various age groups. One or more anterior loops were visible in 39 (40.2%) radiographs encompassing 66 sites (34.4%). Interestingly, anterior loops were most commonly observed bilaterally, followed by on the right side of the mandible only. An anterior loop on the left side only was observed in just 1 radiograph. Visibility of anterior loops reduced as the age of subjects increased. More than half (58.1%) of subjects aged 20-29 years exhibited at least one anterior loop; this gradually reduced to only 15 percent of subjects aged 50 and older. There was no association between visualization of the anterior loop and subject gender.

Jennifer Neo[14] assessed the position of the mental foramen of the local Malays and Indians in Singapore from a series of orthopantomograms. The position of the foramen was recorded in relation to adjacent mandibular teeth, as (1) at the apex of the first premolar; (2) in between the apices of the first and second premolar; (3) at the apex of the second premolar; (4) in between the apices of the second premolar and the first molar; or (5) at the mesial half of the first molar. The results demonstrates the mental foramen to be most commonly located below the apex of the second premolar for the right and left sides of both the Singaporean Malays and Indians. This data has implications in the teaching and practice of dental anesthesia. In both these races, the median location is just below the second premolar.

Wei Cheong Ngeow et al[2] determined the position of the mental foramen in Panoramic radiographs from a selected Malay population. One hundred and sixty nine panoramic radiographs of retrieved from a minor oral surgery waiting list were selected to identify the normal range for the position of the mental foramen. The foramen was not included in the study if there was any mandibular tooth missing between the lower left and right first molars (36-46). The findings indicated the most common position for the mental foramen was in line with the longitudinal axis of the second premolar (69.2%) followed by a location between the first and second premolar (19.6%). The right and left foramina were bilaterally symmetrical in three of six recorded positions in 67.7% patients. The mental foramen was most often in line with the second premolar

Soad M. Mansour et al[22] designed a study to establish the diagnostic reliability of two different panoramic machines (Orthopantomograph 10, Siemens and Planmeca, Finland) to localize the precise position of the mental foramen compared to localization by dissection. A total of 34 mental foramens in human cadavers were studied. The actual measurements on the human cadavers were compared to the radiographic distances measured on the panoramic radiographs. The mean radiographic distances were less than those measured on human cadavers on both right and left sides. A significant difference was found between the actual measurements and that produced by Siemens on both right and left sides, While there was a significant difference between the actual measurements and that produced by Planmeca on the left side only. However, no significant difference was found between both OPG machines. Our result revealed an average of a minimum of 2mm difference between the actual and the radiographic positions of the mental foramen. This difference in measurement should be considered during clinical judgment . Also, in this study the mental foramen appeared more consistent on the Planmeca than on Siemens machine.

Kahraman Gungor et al [16] investigated the most common position of the mental foramen in the panoramic radiographs from a selected Turkish population. The study sample included three hundred and sixty one panoramic radiographs of selected Turkish population taken in Faculty of Dentistry, University of Gazi. The most common position of the mental

foramen was between the first premolar and the second premolar (71.5%). The mental foramen was symmetrical in 90.4% of patients. In this study, the difference of the location of the mental foramen in different ethnics groups was discussed. Clinicians and anthropologists should expect to find the position of the mental foramen to be symmetrical and between the first premolar and the second premolar teeth.

NM Al Jasser et al[7] determined the most common position of the mental foramen from panoramic radiographs in a selected Saudi population and to compare the results with those reported for other populations. Four hundred and fourteen panoramic radiographs of a Saudi population from four different dental centers were studied. The commonest position of the mental foramen was in line with the longitudinal axis of the second premolar (45.3%) followed closely by location between the first and second premolars (42.7%). The mental foramen was symmetrical in 80% of patients. Clinicians should expect to find the position of the mental foramen to be symmetrical and in line with the second premolar teeth.

Shahrazad Sami[23] examined the inter- observer variability in radiographic interpretation of the variable position, shape and appearance of mental foramen. Four examiners, two dental radiologists and two oral surgeons evaluated 30 panoramic radiographs to evaluated the position, shape and appearance of mental foramen. The most frequent position of mental foramen was between first and second premolars then followed by those below the apices of the first and second premolars and the most

frequent shape of mental foramen was irregular where separated type is the frequent appearance of mental foramen. For agreement there was no significant difference between two radiologist for position, shape and appearance of mental foramen, but with a significant difference was found between four observer, for the position of mental foramen. The study concluded that the position of mental foramen is most commonly below and between the premolar teeth and the most frequent shape are irregular and appearance separated type.

Use of other imaging modalities to assess Mental Foramen

Bou Serhal et al[6] assessed the accuracy of panoramic radiography and spiral or computed tomography for the localisation of the mental foramen. The distance from the alveolar crest to the mental foramen was measured from panoramic radiographs, spiral tomograms and CT scans. The same distance was measured during implant surgery using a specially designed caliper. Panoramic radiography showed more deviation (+0.6 mm) from the perioperative measurements than either spiral or computed tomography (+0.4 and 70.3 mm respectively). The difference was significant. In general, distances were overestimated on the panoramic radiographs. Cross-sectional imaging techniques are recommended for the pre-operative planning of implants in the posterior mandible.

Walid S. Salem et al [24] conducted a study as an attempt to evaluate and compare the accuracy of panoramic radiography, conventional tomography and computerized tomography in exactly locating the mental

foramen. Two groups of patients were studied in this work, group (A) consisted of eight edentulous patients ranging in age from 55 to 65 years. Group (B) consisted of eight dentated patients with erupted first and second premolars, canine and first molar ranging in age from 20 to 30 years. Five radiographic techniques namely; panoramic and tomographic (oplique and tangential) views obtained by Scanora multimodal imaging system as well as direct and reformatted coronal computerized tomographic images were used to assess the mental foramen . Out of the results of this study: Computerized tomographic images whether direct or reformatted were highly accurate, sensitive and correlated very well for both of the studied edentulous and dentated groups. The tangential tomograms were highly accurate for the edentulous cases but a significant difference from the standard gold for both groups but with the least difference for the dentated group. The panoramic images were superiorly accurate for the edentulous group of patients. It could be concluded from this study that: The information provided by the panoramic views and tangential tomograms obtained by Scanora multimodal imaging system regarding the location of the mental foramen was highly reliable and accurate for edentulous cases. Both direct and reformatted coronal computerized tomographic images allow for accurate presurgical assessment for dental implants and make it easy for clinicians to visualize implant sites.

Ongkosuwito et al[25] investigated the reliability of length measurements of the mandible by comparing orthopantomograms (OPTs) with lateral cephalograms. OPTs and lateral cephalograms were taken of 20 human dry skulls. Four orthodontists and four maxillofacial surgeons located landmarks on all radiographs using a computer program for cephalometric measurements. Intraobserver and interobserver variability in locating landmarks was assessed, as well as positioning of the skulls prior to radiography between the x-ray assistants. Magnification differences between the left and right side of the mandible on the OPT were determined for five skulls. Kappa statistics were used to calculate the intraclass correlation coefficient (ICC) for intraobserver and interobserver differences. An F test was used to assess differences between methods and between type of observer. For ramus length (distance between condylion and gonion: Co-Go), an ICC of at least .61 was reached in 96.4% of the OPT measurements and in 82.1% of the lateral cephalogram measurements for ramus length. For total mandibular length(distance between condylion and menton: Co-Me), a substantial measurement (ICC$.61) was reached in 89.3% of the OPT measurements and in 67.9% of the lateral cephalogram measurements. For body length (distance between gonion and menton: Go-Me), a substantial measurement (ICC 0.61) was reached in 67.9% of the OPT measurements and in 64.3% of the lateral cephalogram measurements for body length. No significant differences were found in the magnification factor of the left and right side of the mandible. Compared with a lateral

cephalogram, the OPT had comparable reliability in measuring mandibular distances condyliongonion, gonion-menton, and condylion-menton. No significant differences were observed between the x-ray assistants in taking the OPTs and lateral cephalograms or in repositioning the skulls. Significant differences were found between orthodontists and maxillofacial surgeons for landmark measurements. An OPT is as reliable as a lateral cephalogram for linear measurements of the mandible.

D. ABNORMALITIES IN THE LOCATION OF THE MENTAL FORAMEN

Asymmetrical Mental Foramens

Flora M. Fabian [15] aimed at documenting the location, shape, and direction of the opening of the mental foramen in dry mandibles of adult black Tanzanian population. A hundred mandibles were available for studying.. The mental foramen was asymmetrically located between the right and left sides in 78% of the mandibles. Unilateral double mental foramen was observed in 3% of the mandibles.

Absent Mental Foramens

Tabinda Hasan et al[26] reported a case with bilaterally absent mental foramina . The case was encountered during routine dissection tutorials and represents a rare anatomic variation –agenesis of the mental foramen. A steel wire was introduced into the mandibular foramina of the aforementioned mandible and the length of the pervious wire was recorded for right and left sides. Absent mental foramen is a rare anatomical

variation. Absence of mental foramen (unidentified type) on panoramic radiographs may result most often from superimposition of teeth, trabecular pattern of bone, thinning of mandible and false radiography results due to overall dark radiographs. Very few cases report the actual absence of mental foramen. Such cases are often accidentally revealed on CT scans or dry human mandible studies. In fact, man is the only primate known to have agenesis of the mental foramen. Absence of mental foramen is not a frequent occurrence. In a previous study, no mental foramen was found in only 3 cases out of 2870 sides of 1435 dry skulls. The foramen was absent twice in the right side and once in the left side. The frequency of unilateral absence of the mental foramen ranges from less than 0.02% to 0.47% There have yet been no reports of any sexual or ethnic influence in mental foramen absence

Triple Mental foramens

Anwar Ramadhan et al [27] reported a case of triple mental foramina at the right side of the premolar region, which was discovered during reposition and ostheosynthesis of a mandible fracture.

In the article of Anwar Ramdhan[27] et al, Following discussion were made regarding abnormalities of mental foramen. **Naitoh** studied 157 patients using cone-beam computed tomography and found 11 patients that had double on one side (7%) and two (1.2%) that had triple mental foramina on the contra lateral side. **Gershenson** examined 525 dry mandibles focusing on variation, shape and site of the mental foramen related to the

teeth, reported that 4.3% mandibles had double mental foramina, and 0.7% mandibles had triple mental foramina. Finally they found one mandible that had four mental foramina on one side (0.1%)

Double mental foramens

In the article of **Anwar Ramdhan et al**[27], Following discussion were made regarding abnormalities of mental foramen. **Serman** examined 408 dry human mandibles and found one extra foramen on one side in seven mandibles constituting 1.7% and in two specimens bilateral double mental foramina. Altogether eleven double mental foramina were documented on 408 mandibular specimens (2.7%). In Thailand **Stithipon and his colleagues** studied 110 mandibles and found only two (1.8%), that had double mental foramina. **Katakami et el** examined 150 patients retrospectively with limited cone-beam computed tomography and depicted 16 double foramina (10.6%) and triple mental foramina on one side (0.6%).

Accessory Mental Foramens

In the article of **Anwar Ramdhan et al**[27], following discussion were made regarding abnormalities of mental foramen. **Sawyer et al** reported 5.9% accessory mental foramen in four ethnic groups and the maximum number found in any population was two.

Study Topic

The topic of study is "Radiographic Evaluation of mental foramen in a Hospital based population"

Study Design

This is a cross sectional hospital based prevalence study designed to evaluate and locate the position, symmetry, shape, size and abnormalities of the mental foramen using orthopantomograms in a hospital based population

Study Duration

This is a cross sectional hospital based study conducted between January 2009 to March 2011 in the outpatient Department of Oral Medicine and Radiology, Ragas Dental College and Hospital

Type of Study

This is a Cross sectional Prevalence study done in a Hospital based population

Study Population

Includes patients reporting to Ragas Dental College and Hospital, seeking dental treatment.

Study Sample

Subjects of the present study consisted of patients reporting to the outpatient Department of Oral Medicine and Radiology, Ragas Dental College and Hospital, seeking dental treatment and referred to Radiology department for Panoromic radiography. The study consists of 500 patients and is divided into 5 groups. Each group contains 50 males and 50 Females

- Group 1 consists of 50 male patients and 50 female Patients within the age group of 5-12 years
- Group 2consists of 50 male patients and 50 female Patients within the age group of 13-18 years
- Group 3 consists of 50 male patients and 50 female Patients within the age group of 19-40 years
- Group 4 consists of 50 male patients and 50 female Patients within the age group of 41-65 years
- Group 5consists of 50 male patients and 50 female Patients within the age group of > 65years

Obtaining approval from the authorities

Permission from the ethical committee of the Ragas Dental College &Hospital was obtained before the starting of the study for interpretation and examining patients and also for exposing the patients for an extra oral radiograph. Also an informed consent (Annexure-III) was obtained from the patients forming the study sample, to participate in the study

SELECTION CRITERIA

Inclusion Criteria

Patients within the age group of 5 years and above reporting and referred to the outpatient department of Oral Medicine and Radiology, Ragas Dental College and Hospital were taken into the study group. Patients within 5-12 years with erupted deciduous molars and in patients where there

is eruption of 1st and 2nd premolars between 10 to 12 years are included. Patients with completely edentulous mandibular jaw are also included in the study

Exclusion Criteria

Patients with the following conditions are excluded from the study.

1. Presence of a radiolucent lesion in lower jaw anywhere in the area extending from the right first molar to the left first molar.
2. Presence of a missing tooth in the lower jaw (34,35and 44,45) in dentulous patients
3. Non visualization of the mental foramen bilaterally.
4. Presence of periodontal lesions.
5. Patient with previous orthodontic treatment.
6. Presence of crowding and spacing in the lower arch.
7. Patients with erupting Succedenaeous teeth in the Mixed Dentition stage masking the foramen radiographically

MATERIALS

1. **For examination of the patient**

   The findings of the examination are entered in the case sheet Performa (Appendix II) with necessary demographic details

   a. Physiological dental chair with provision for artificial illumination
   b. Mouth mask
   c. Sterile glove

d. Dental Mouth mirror

e. Dental Explorer

f. Periodontal probe

g. Kidney tray

h. Cotton

2. For Radiographic procedure

a) Planmeca Dental Panoramic radiographic unit with specifications of 80 Kv, 12 mA, magnification factor 20%

b) Panoramic films (East men- Kodak, Rochester, USA)

c) Lead apron

3. For processing the exposed films

a) Developer and fixer powder (premier, Nasik dust powder India limited, India.)

b) Warm water (30^0 C)

c) A well equipped light proof dark room with safe light (GBX- 2) at a distance of four feet from the operating surface.

d) Two 13.5 liter tanks for developer and fixer solutions

e) A master tank provided with circulatory water supply

f) Thermometer

g) A manual timer

h) Film hanger

i) Drier containing heating coil and a fan behind the coil (Engineering surgical works, Chennai, India)

4. For Radiographic interpretation

a. Room with subdued ambient illumination
b. Radiographic viewer with black blocking board
c. Magnifying lens.
d. Acetate Tracing paper (0.003 Matte finish) with lead pencil on illuminated board
e. Measuring scale
f. Set square
g. Divider

The assessment of the mental foramen done on the panoramic radiograph is entered in the radiographic assessment sheet (Annexure II) along with patient demographics

METHODS

Clinical Examination

Study samples with the mentioned inclusion criteria who are indicated for panoramic radiographs are first clinically assessed in the dental chair using a dental mouth mirror and probe. On clinical examination, patients with missing lower premolars or periodontal lesions and patients with crowding of lower teeth or with a history of previous orthodontic treatment are excluded from the study in the clinical examination stage itself. The findings of the examination along with the demographic details are entered in the case sheet proforma (Annexure -II). The patients are then taken to the radiology department for taking panoramic radiographs

Extra oral Panoramic radiographic procedure:

Film:

Type- Kodak screen film, green light sensitive

Size-15X 30 cms or 6x12 inches.

Cassette:

Size- 15X 30 cms or 6x12 inches

PM 2002 Proline EC

Screen:

Speed- Medium (400)

Light emitted-green

After the clinical examination and blood investigations, a panoramic radiograph was taken. Patients were explained briefly about the radiographic procedure and written consent was taken in the prescribed format. Patients were made to wear the lead apron

Technique for taking OPG Radiograph[28]

The panaromic machine is first switched on. The control panel lights will come on and the unit will carry out a self test which will last a few seconds. When the self test is completed a message PASS will appear on the main display. The time will then appear on the main display. The unit is now ready for use.

Loading the cassette: The return key is pressed on the display unit and the cassette carriage is brought to the loading position.

- In the dark room the latches of the cassette is pushed inwards and the cassette is opened and the film is placed in the cassette. The film is placed on the intensifying screen on the cassette and positioned so that it touches the bottom edge. The cassette is carefully closed by pressing the door from below the latches.
- The loaded cassette is now slid into the cassette carriage, according to arrow mark on the door of the cassette, and is pushed till the end.
- The patient is asked to remove any spectacles, hearing aids, dentures and personal jewellery such as earring, necklaces and hair pins. Protective lead apron is placed over the patients back.
- The chin rest is adjusted and a bite piece (fork) is placed on the top of the chin rest.
- For edentulous patients, the chin support can be used alone without the bite fork.
- The PAN mode is first selected on the control panel, by pressing and holding PAN button.
- The exposure values of 80 kvp and 12 mA are selected. The temple support key is pressed and the temple supports are opened. The patient is guided to the unit so that they are facing the chin rest. The height adjusting keys are pressed and the height is adjusted until the chin rest is slightly higher than the patient's chin. The patient is asked to step forward, grasp the patient handles, stretch up and place their chin on the chin rest. The incisal edges of the maxillary,

mandibular teeth must be in the groove in the bite piece. The temple support key is pressed to close the temple supports. The focal trough positioning keys are pressed and the three patient positioning lights appear.

- The patient's head is positioned so that the midsagittal plane coincides with the midsagittal plane light beam, and the Frankforts plane coincides with the frankforts plane light beam. The apxes of the patient's upper central incisor is placed within the image layer (focal trough) of the unit.
- The focal trough positioning keys are adjusted so that the focal trough light, which indicates the centre of the focal trough, falls between the second incisor and canine.
- After this patient positioning the ready key on the control unit is pressed. The patient is asked to close their lips on the bite block, swallow and place their tongue flat against the roof of the mouth, breathe normally and stand as still as possible.
- The exposure button is pressed on the remote control and is held for the full exposure duration of 18 seconds.
- After exposure the temple supports will open automatically and patient is guided back from the unit.
- The return key is pressed on the control unit and the cassette carriage will return back to loading position. The cassette is removed from the cassette carriage and the film is processed in the dark room**.**

Processing of the Panoramic radiographic films[28]:

All the patients radiographs were processed in a well equipped, light proof dark room as described by Goaz P W., White S. C10 [28]

a) The developing and fixing solution were prepared according to the manufacturers instructions.
b) The temperature of the solution was maintained at 72 - 72.5° F throughout the procedure.
c) Under a safe light provided with a 15-watt bulb and adequate filtration was kept 4 feet above the working area. The film was kept in the developing and the time was noted. Agitate the hanger with film for 5 seconds to sweep air bubbles off the films. After 4 minutes the film was taken out from the developer solution and rinsed in running water for 20 seconds. Then the film was placed in the fixer solution for 15 minutes**.**
d) The films were then placed in running water for at least 20 minutes to remove residual processing solution
e) The films were then dried in a drier with circulating moderate warm air. Likewise all exposed films were processed.

Interpretation of the Panoramic radiographs[28]

All the radiographic interpretations were carried out in a room with subdued ambient illumination with the help of the radiographic viewer and a magnifying lens. Radiographs with the presence of a radiolucent lesion in lower jaw anywhere in the area extending from the right first molar to the

left first molar and radiographs with non-visualization of mental foramen bilaterally were excluded from the study in this stage

A. Radiographic interpretation of the position of the foramen[11]

1. Dentulous patients

The mesio-distal position of mental foramen is assessed on the panoramic radiograph with reference to the dentition in case of dentulous patients. The Position of the mental foramen is recorded with reference to the apex of the tooth. The edge of the ruler was used to identify the long axis of the nearest tooth and the position of the mental foramen was recorded in relation to this. If the mental foramen was too large or was situated between the teeth, the position of the foramen was established after drawing an imaginary line parallel to the long axis of the tooth. After evaluation on each side (right and left) in the panoramic radiograph, the position was recorded as any one of the following ten options

1. Situated at the apex of first deciduous molar
2. Situated at the apex of second deciduous molar
3. Situated anterior to the apex of first premolar
4. In line with the apex of first premolar.
5. Between the apex of first and second premolars
6. In line with the apex of second premolar
7. Between the apex of second premolar and first molar
8. In line with the apex of first molar

2. Edentulous Patients[25]

It is not possible to locate the position of the mental foramen in relation to dentition in edentulous patients. Hence a different approach has to be made. Following steps were done to assess the position of the mental foramen

Step 1: Plotting the reference points [25]

The Lead acetate Tracing sheet is placed on the panoramic radiograph on the illuminated viewer box. The outer border of the mandible is drawn using a pencil from the right condyle to the left condyle. Tangent to the outer border of the ramus of the mandible is drawn. Two reference points are plotted on the mandible. The outermost point of the condyle and the outermost point on the lower border of the ramus. The third reference point is derived using a setsquare at the midpoint of the ramus of mandible down at the deepest concavity tangent to the outer border of the ramus of the mandible.

Step 2: Plotting the midline reference plane

The three reference points plotted on the right and left side are joined together to form a three horizontal reference plane. The midpoint of the three horizontal reference planes are plotted. The three midpoint reference points are joined together to form midline reference plane.

Step 3: Calculation of the distance between mental foramen and midline reference plane

The centre point of the mental foramen is plotted in the tracing sheet. Its distance from the midline reference plane is calculated using a divider.

Step 4: Assesment of the position

Using the calculated distance, the position of the mental foramen is predicted with reference to the dentition by transferring the same measurement onto a another dentulous panoramic radiograph. The following steps are done.

a) Dentulous patients radiographs of similar age group and gender is taken
b) Midline reference plane is acquired by repeating the Steps 1,2 are on the dentulous radiographs
c) The calculated distance is taken on the divider and placed on the midline reference plane and the required measurement is marked below the apices of tooth
d) This marked point position is assessed whether it falls on the anyone of the ten positions and entered in the proforma (Annexure II)
    1. Situated at the apex of first deciduous molar
    2. Situated at the apex of second deciduous molar
    3. Situated anterior to the apex of first premolar
    4. In line with the apex of first premolar.
    5. Between the apex of first and second premolars

6. In line with the apex of second premolar
7. Between the apex of second premolar and first molar
8. In line with the apex of first molar

A. Assessment of the symmetry of the Mental foramen[1]

1. Dentulous mandible

The location of the foramen on the left and right side of the mandible is assessed. If the position of the foramen is present on the same location (with reference to the dentition) as the other side, it is considered as symmetrical. If there is difference in the location of the mental foramen compared to the contra lateral side, it is entered in the profoma sheet as asymmetrical mental foramens

2. Edentulous mandible

The distance from the midline reference plane is calculated to the right and left mental foramens. If the distance to the right and left mental foramen is same, it is considered as symmetrical or they are considered to be asymmetrical mental foramens

B. Measurement of the size of the foramen[12]

The mesiodistal measurement of the outer border of the mental foramen radiolucency seen on the panoramic radiograph is first measured using a divider and a scale in the right and left side of the mandible

C. Assessment of the shape of the foramen[3]

The mental foramen shape was assessed either as round or oval. The shape of the mental foramen is considered oval if the horizontal diameter

and vertical diameter of the mental foramen are unequal. The shape of the mental foramen is considered round if horizontal and vertical diameters of the mental foramen are equal

D. Assessment of the abnormalities of mental foramens[26,27]

The panoramic radiograph is assessed carefully for the following abnormalities in the panoramic radiograph

1. Unilateral absence of Mental Foramens
2. Accessory Mental Foramens
3. Double/Triple Mental foramens

Statistical Analysis:

All the data were entered in Master Chart using Microsoft excel sheets (Annexure-1). Statistical analysis was done using SPSS (Statistical Package for Social Science) software SYSTAT version 7.0

Following statistical tests were done.

1. CHI SQUARE TEST - The quantity of x^2 describes the magnitude of discrepancy between theory and observation.

The quantity of x^2 is defined as:

$$x^2 = \Sigma (O-E)2 / E$$

Σ (Observed frequency- expected frequency)2/ Expected frequencies

Where O= observed frequencies

E = expected frequencies

P- value: probability of differences

P> 0.05 = Difference is not significant (NS)

P≤ 0.05 = Difference is significant (S)

P≤ 0.01 = Difference is highly significant (S)

P≤ 0.001= Difference is very highly significant (HS)

2. MEAN

Arithmetic Mean

$$\bar{x} = \frac{\sum_{i=1}^{n} x_i}{n}$$

Where $\sum_{i=1}^{n} x_i = x_1 + x_2 + x_3 + x_4 + \ldots\ldots + x_n$

Standard Deviation: A measure of the dispersion among the elements in a set of data.

Standard deviation can be defined as follows:

$$s = \sqrt{\frac{\sum_{i=1}^{n} (x_i - \bar{\mu})^2}{n - 1}}$$

Where: $\bar{\mu}$ is the mean, i is the index
n is the total number of data points
x_i represents a data point

3. ONE WAY ANALYSIS OF VARIANCE (ANOVA)

This test is useful for comparing mean values of three or more groups.

It is obtained by calculating the ratio of between groups mean square to the within groups mean square.

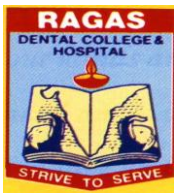
$$\text{F ratio} = \frac{\text{Variation between observed group averages}}{\text{Variation within each group}}$$

$p > 0.05$ = Difference is not significant

$p \leq 0.05$ = Difference is significant (S)

$p \leq 0.01$ = Difference is highly significant (S)

$p \leq 0.001$ = Difference is very highly significant (HS)



RAGAS DENTAL COLLEGE & HOSPITAL

2/102, East Coast Road, Uthandi, Chennai - 600119

DEPARTMENT OF ORAL MEDICINE & RADIOLOGY

CASE SHEET PROFORMA

A. General information.

DATE:

S.NO:

O.P. NO:

1. Name:
2. Age:
3. Sex: a. Male b. Female:
4. Occupation:

    a. Unemployed
    b. Professional
    c. Administration
    d. Trade/Business
    e. Student

5. Address:

6. Income;

   a. <Rs. 1,000/month

   b. >1,000-5,000/month

   c. >5,000/month

B. Past Dental history.

History of previous orthodontic treatment.

History of extraction.

History of periodontal treatment.

C. Intra oral examination:

Decay:

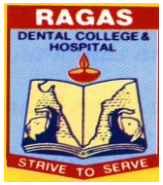
Missing:

Filled:

Mobility:

D. Investigation:

Orthopantamogram.



SL.NO. **OP NO. :** **DATE :** **NAME :** **AGE / SEX :**

Position	**Anatomic position of mental foramen**	**Presence of mental foramen in opg**		**Symmetry of left side as compared with right side**		**Size of mental foramen**		**Shape of mental foramen**		**Abnormality**	
		Right side	**Left side**	**Symm--etrical**	**Asymm--etrical**	**Right side**	**Left side**	**Right side**	**Left side**	**Right side**	**Left side**
1.	Situated at the apex of first deciduous molar										
2.	Situated at the apex of second deciduous molar										
3.	Situated anterior to the apex of first premolar										
4.	In line with the apex of first premolar.										
5.	Between the apex of first and second premolars										
6.	In line with the apex of second premolar										
7.	Between the apex of second premolar and first molar										
8.	In line with the apex of first molar.										

Figure 1: Armamentarium for Patient Examination

Dental Mouth Mirror Probe and Kidney Tray

Figure 2: Armamentarium for taking Orthopantomogram

OPG Film

Figure 3: OPG Cassette

Figure 4 : Patient Positioning and Exposure

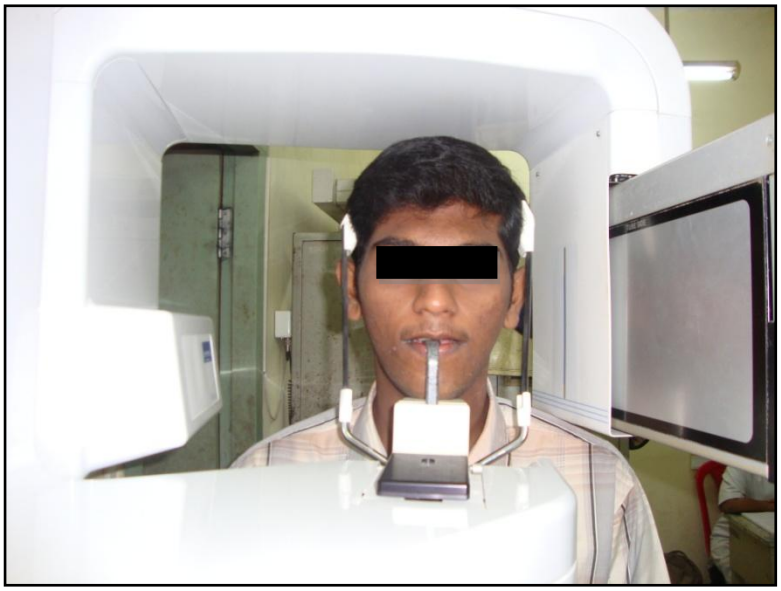


Figure 5: A & B - Processing the Film

Figure 6A : Assessment of the Mental Foramen on the Illuminated Viewer Box

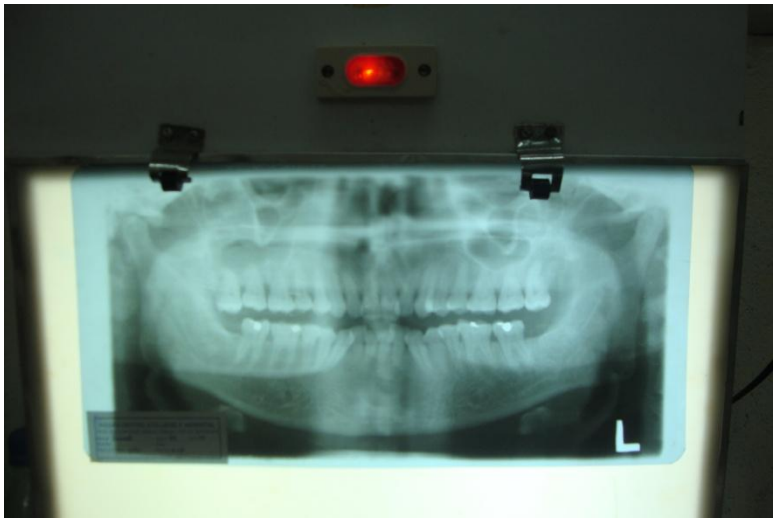
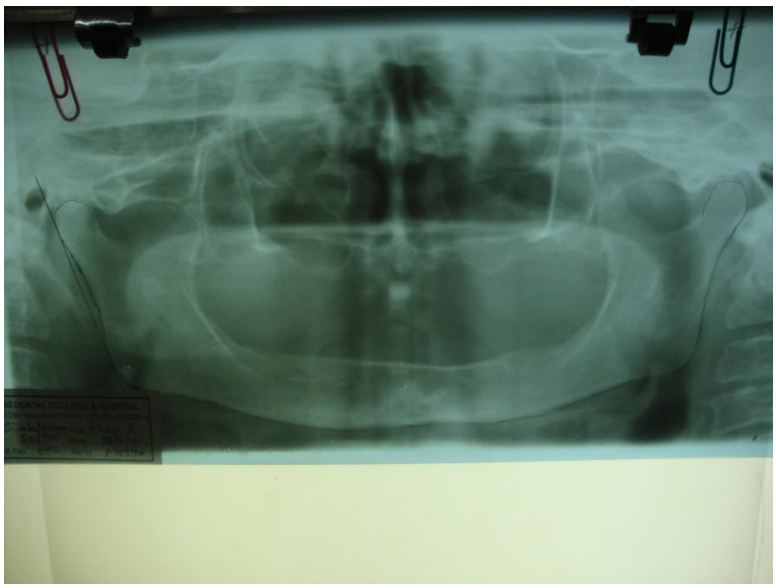


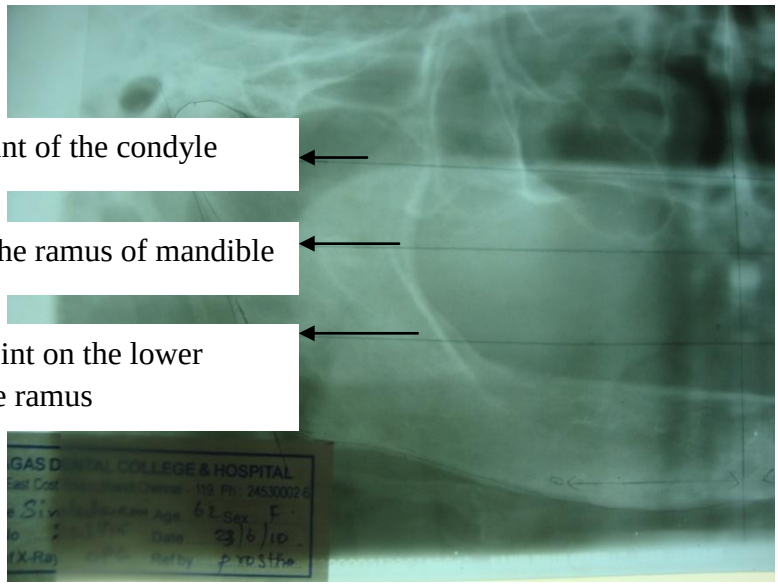
Figure 6B: Divider and Scale

Figure 7: Assessment of the Mental Foramen in Edentulous Mandibles

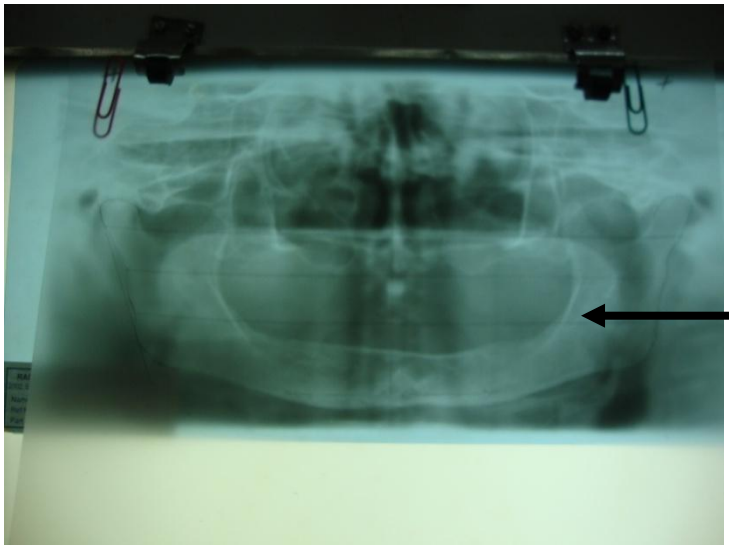
A.Tangent to the outer border of the ramus of the mandible



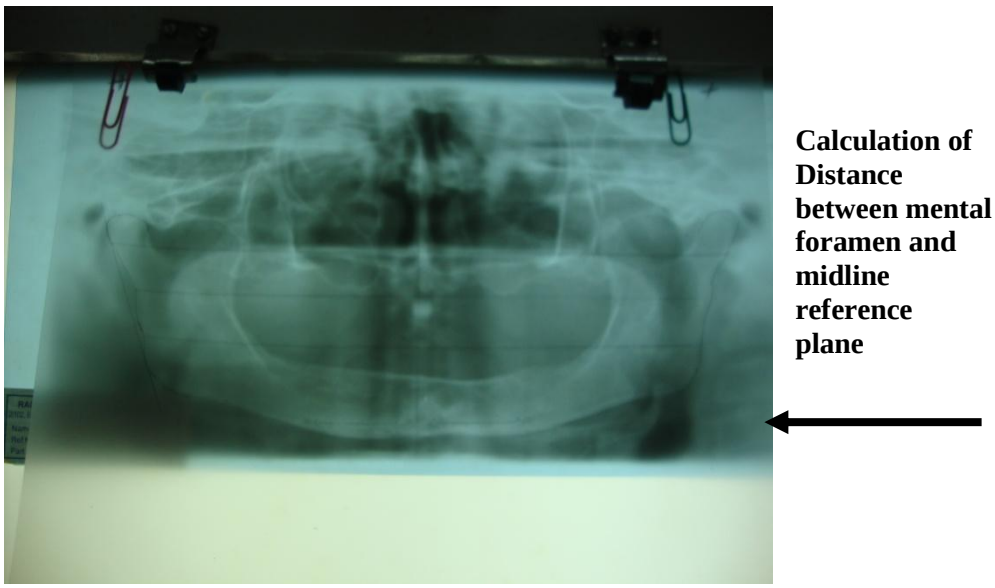
B.Plotting the Reference Points



C. Plotting the midline reference plane



D. Calculation of the distance between mental foramen and midline reference plane



The Present study is a cross-sectional prevalence study of a hospital based population which was conducted in Department of Oral Medicine and Radiology, Ragas Dental College and Hospital, Chennai. The study was conducted between January 2009 and March 2011. It was designed to evaluate and locate the position, symmetry, shape, size and abnormalities of the mental foramen using orthopantomograms in a hospital based population. The data obtained were entered in Microsoft excel work sheets and were statistically analyzed. The results obtained were compared with various variables included in the study and presented here.

Table 1and Graph 1-5 shows the distribution of presence of mental foramen in the right side of mandible across gender and age group. The sample size of the study was 500 and was divided equally into 5 age groups each of sample size 100 constituiting50 male and 50 female patients.

In group 1 of age group 5-12 years of age, the presence of the mental foramen was found situated in the apex of first deciduous molars in 25 (25%) patients of which 8(8%) of the patients were males and 17(17%) of the patients were females. The presence of the mental foramen was found situated in the apex of second deciduous molars in 54 (54%) patients of which 31(31%) of the patients were males and 23(23%) of the patients were females. The presence of the mental foramen was found situated in the apex of first premolar in 2 (2%) patients of which 2(2%) of the patients were males. The presence of the mental foramen was found situated between the apex of first and second premolars in 2(2%) patients of which 2(2%) of the

patients were females The presence of the mental foramen was not found situated anterior to the apex of first premolar, between the apex of second premolar and first molar and in line with the apex of first molar. The distribution of presence of mental foramen in the right side of mandible across age group was not statistically significant, p-Value > 0.75.

In group 2 of age group 13-18 years of age, the presence of the mental foramen was found situated in line with the apex of second premolar in 72 (72%) patients of which 36(36%) of the patients were males and 36(36%) of the patients were females patients. The presence of the mental foramen was found situated in the apex of first premolar in 4 (4%) patients of which 4(4%) of the patients were females. The presence of the mental foramen was found situated between the apex of first and second premolars in 22 (22%) patients of which 14(14%) of the patients were males and 8(8%) were females. The presence of the mental foramen was found between the apex of second premolar and first molar in 2(2%) patients of which 2(2%) of the patients were females. The presence of the mental foramen was not found situated at the apex of first deciduous molar, at the apex of the second deciduous molar, anterior to the apex of first premolar and in line with the apex of the first molar. The distribution of presence of mental foramen in the right side of mandible across age group was statistically significant, p-Value< 0.05.

In group 3 of age group 19-40 years of age, the presence of the mental foramen was found situated in line with the apex of second premolar

in 56 (56%)patients of which 30(30%) of the patients were males and 26(26%) of the patients were females patients. The presence of the mental foramen was found situated between the apex of first and second premolars in 34 (34%) patients of which 18(18%) of the patients were males and 16(16%) were females. The presence of the mental foramen was found between the apex of second premolar and first molar in 10(10%) patients of which 6(6%) of the patients were males and 4 (4%) were females. The presence of the mental foramen was not found situated at the apex of first deciduous molar, second deciduous molar, in line with the apex of first molar and anterior to the apex of first premolar. The distribution of presence of mental foramen in the right side of mandible across age group was not statistically significant, p-Value > 0.66.

In group 4 of age group 41-65 years of age, the presence of the mental foramen was found situated in line with the apex of second premolar in 79 (79%) patients of which of the 35(35%) patients were male and 44(44%) of the patients were females patients. The presence of the mental foramen was found situated between the apex of first and second premolars in 19(19%) patients of which 13(13%) of the patients were males and 6(6%) were females. The presence of the mental foramen was found between the apex of second premolar and molar in 2(2%) patients of which 2(2%) of the patients were males. The presence of the mental foramen was not found situated in line with the apex of first premolar, first molar, at the apex of first deciduous molar , at the apex of the second deciduous molar and

anterior to the apex of first premolar. The distribution of presence of mental foramen in the right side of mandible across age group was not statistically significant, p-Value> 0.06.

In group 5 of age group above 65 years of age, the presence of the mental foramen was found situated in line with the apex of second premolar in 83 (83%) patients of which 41(41%) of the patients were males and 42(42%) of the patients were females patients. The presence of the mental foramen was found situated between the apex of first and second premolars in 11 (11%) patients of which 7(7%) of the patients were males and 4(4%) were females. The presence of the mental foramen was found between the apex of second premolar and molar in 6(6%) patients of which 4(4%) of the patients were males and 2(2%) were females. The presence of the mental foramen was not found situated in line with the apex of first premolar, first molar, at the apex of first deciduous molar , at the apex of the second deciduous molar and anterior to the apex of first premolar. The distribution of presence of mental foramen in the right side of mandible across age group was not statistically significant, p-Value > 0.47.

Table 2 and Graph 5-10 shows the distribution of presence of mental foramen in the Left side of mandible across gender and age group. The sample size of the study was 500 and was divided equally into 5 age groups each of sample size 100 consisting of 50 male and female patients.

In group 1 of age group 5-12 years of age, the presence of the mental foramen was found situated in the apex of first deciduous molars in28 (28%) patients of which 13(13%) of the patients were males and 15(15%) of the patients were females. The presence of the mental foramen was found situated in the apex of second deciduous molars in 53 (53%) patients of which 28(28%) of the patients were males and 25(25%) of the patients were females. The presence of the mental foramen was found situated between the apex of first and second premolars in 7(7%) patients of which 3(3%) of the patients were males and 4(4%) were females. The presence of the mental foramen was found in line with the apex of second premolar in 12 (12%) patients of which 6(6%) of the patients were males and 6(6%) were females The presence of the mental foramen was not found situated anterior to the apex of first premolar, in line with the apex of first premolar, between the apex of second premolar and first molar and in line with the apex of first molar. The distribution of presence of mental foramen in the left side of mandible across age group was not statistically significant, p-Value > 0.92.

In group 2 of age group 13-18 years of age, the presence of the mental foramen was found situated in line with the apex of second premolar in 82 (82%)patients of which 44(44%) of the patients were male and 38(38%) of the patients were females patients. The presence of the mental foramen was found situated in the apex of first premolar in 4 (4%) patients of which 4(4%) of the patients were females. The presence of the mental foramen was found situated between the apex of first and second premolars

in 8(8%) patients of which 6(6%) of the patients were males and 2(2%) were females. The presence of the mental foramen was found between the apex of second premolar and molar in 6(6%) patients of which 6(6%) of the patients were females. The presence of the mental foramen was not found situated at the apex of first deciduous molar, at the apex of the second deciduous molar, anterior to the apex of first premolar, in line with the apex of the first molar. The distribution of presence of mental foramen in the left side of mandible across age group was not statistically significant, p-Value> 0.06.

In group 3 of age group 19-40 years of age, the presence of the mental foramen was found situated in line with the apex of second premolar in 66 (66%)of which 38(38%) of the patients were males and 28(28%) of the patients were females patients. The presence of the mental foramen was found situated between the apex of first and second premolars in 24 (34%) patients of which 6(6%) of the patients were males and 18(18%) were females. The presence of the mental foramen was found between the apex of second premolar and first molar in 10(10%) patients of which 6(6%) of the patients were males and 4 (4%) were females. The presence of the mental foramen was not found situated at the apex of first deciduous molar, second deciduous molar, in line with the apex of first molar and anterior to the apex of first premolar. The distribution of presence of mental foramen in the left side of mandible across age group was statistically significant, P-Value< 0.019.

In group 4 of age group 41-65 years of age, the presence of the mental foramen was found situated in line with the apex of second premolar in 81 (81%)of which 38(38%) of the patients were male and 43(43%) of the patients were females patients. The presence of the mental foramen was found situated between the apex of first and second premolars in 11 (11%) patients of which 7(7%) of the patients were males and 4(4%) were females. The presence of the mental foramen was found between the apex of second premolar and molar in 8(8%) patients of which 5(5%) of the patients were males and 3(3%) were females. The presence of the mental foramen was not found situated in line with the apex of first premolar, first molar, at the apex of first deciduous molar , at the apex of the second deciduous molar and anterior to the apex of first premolar. The distribution of presence of mental foramen in the left side of mandible across age group was not statistically significant, p-Value> 0.44.

In group 5 of age group above 65 years of age, the presence of the mental foramen was found situated in line with the apex of second premolar in 80 (80%)of which 37(37%) of the patients were males and 43(43%) of the patients were females patients. The presence of the mental foramen was found situated between the apex of first and second premolars in 8 (8%) patients of which 5(5%) of the patients were males and 3(3%) were females. The presence of the mental foramen was found between the apex of second premolar and molar in 12(12%) patients of which 8(8%) of the patients were males and 4(4%) were females. The presence of the mental foramen was not

found situated in line with the apex of first premolar, first molar, at the apex of first deciduous molar , at the apex of the second deciduous molar and anterior to the apex of first premolar. The distribution of presence of mental foramen in the left side of mandible across age group was not statistically significant, p-Value> 0.31.

Table-3 and Graph 11 shows the distribution of symmetry of mental foramen of the Left side as compared with the right side across age group..In group 1 of age group 5-12 years of age, the presence of the mental foramen was found Symmetrical in 86(86 %) of patients and Asymmetrical mental foramens in 14(14%) of the patients. The distribution of symmetry of mental foramen of the Left side as compared with the right side in age group 1(5-12 years of age) was not statistically significant, p-Value > 0.074. In group 2 of age group 13-18 years of age, the presence of the mental foramen was found Symmetrical in 78(78 %) of patients and Asymmetrical mental foramens in 22(22%) of the patients. The distribution of symmetry of mental foramen of the Left side as compared with the right side in age group 2(13-18 years of age) was not statistically significant, p-Value > 0.114 .In group 3 of age group 19-40 years of age, the presence of the mental foramen was found Symmetrical in 76(76 %) of patients and Asymmetrical mental foramens in 24(24%) of the patients. The distribution of symmetry of mental foramen of the Left side as compared with the right side in age group 3 (13-18 years of age) was not statistically significant, p-Value > 0.592. In group 4 of age group 41-65 years of age, the presence of the mental foramen was

found Symmetrical in 86(86 %) of patients and Asymmetrical mental foramens in 14(14%) of the patients. The distribution of symmetry of mental foramen of the Left side as compared with the right side in age group 4 (41-65 years of age) was not statistically significant, p-Value > 0.194. In group 5 of age group >65 years of age, the presence of the mental foramen was found Symmetrical in 91(91 %) of patients and Asymmetrical mental foramens in 9 (9%) of the patients. The distribution of symmetry of mental foramen of the left side as compared with the right side in age group5 (>65 years) was statistically significant, p-Value < 0.015.

Table -4 and Graph 12 shows the distribution of shape of mental foramen on right side of mandible across gender and age group. Following is the distribution of round mental foramens on right side of mandible across gender and age group. In Age group 1 (5-12 years of age), 44(44%) of the patients had round mental foramens of which 20(20%) were males and 24(24%) were females. In Age group 2 (13-18 years of age), 46(46%) of the patients had round mental foramens of which 24(24%) were males and 22(22%) were females. In Age group 3 (19-40 years of age), 58(58%) of the patients had round mental foramens of which 32(32%) were males and 26(26%) were females. In Age group 4 (41-65 years of age), 37(37%) of the patients had round mental foramens of which 15(15%) were males and 22(22%) were females. In Age group 5 (>65 years of age), 40(40%) of the patients had round mental foramens of which 23(23%) were males and 17(17%) were females. However none of these values were statistically

significant, p-Value > 0.05. Following is the distribution of the oval mental foramens on right side of mandible across gender and age group. In Age group 1 (5-12 years of age), 56(56%) of the patients had oval mental foramens of which 30(30%) were males and 26(26%) were females. In Age group 2 (13-18 years of age), 54(54%) of the patients had oval mental foramens of which 26(26%) were males and 28(28%) were females. In Age group 3 (19-40 years of age), 42(58%) of the patients had oval mental foramens of which 18(18%) were males and 24(24%) were females. In Age group 4 (41-65 years of age), 63(63%) of the patients had oval mental foramens of which 35(35%) were males and 28(28%) were females. In Age group 5 (>65 years of age), 60(60%) of the patients had oval mental foramens of which 27(27%) were males and 33(33%) were females. Distribution of shape of mental foramen on right side of mandible across gender and age group was not statistically significant, p-Value > 0.546 in group 1, p-Value>0.841 in group2, p-Value>0.311 in group 3, p-Value>0.214 in group 4, p-Value>0.307 in group5.

Table 5 and Graph 13 shows the distribution of shape of mental foramen on left side of mandible across gender and age group. Following is the distribution of the round mental foramens on left side of mandible across gender and age group. In Age group 1 (5-12 years of age), 44(44%) of the patients had round mental foramens of which 20(20%) were males and 24(24%) were females. In Age group 2 (13-18 years of age), 48(48%) of the patients had round mental foramens of which 26(26%) were males and

22(22%) were females. In Age group 3 (19-40 years of age), 58(58%) of the patients had round mental foramens of which 30(30%) were males and 28(28) were females. In Age group 4 (41-65 years of age), 41(41%) of the patients had round mental foramens of which 17(17%) were males and 24(24%) were females. In Age group 5 (>65 years of age), 46(46%) of the patients had oval mental foramens of which 29(29%) were males and 17(17%) were females. However none of these values were statistically significant, p-Value > 0.05.Following is the distribution of the oval mental foramens on left side of mandible across gender and age group.

In Age group 1 (5-12 years of age), 56(56%) of the patients had oval mental foramens of which 30(30%) were males and 26(26%) were females. In Age group 2 (13-18 years of age), 52(52%) of the patients had oval mental foramens of which 24(24%) were males and 28(28%) were females. In Age group 3 (19-40 years of age), 42(42%) of the patients had oval mental foramens of which 20(30%) were males and 22(22%) were females. In Age group 4 (41-65 years of age), 59(59%) of the patients had oval mental foramens of which 33(33%) were males and 26(26%) were females. In Age group 5 (>65 years of age), 54(54%) of the patients had oval mental foramens of which 33(33%) were males and 21(33%) were females. Distribution of shape of mental foramen on right side of mandible across gender and age group was not statistically significant in group 1,2,3,4., p-Value > 0.546 in group 1, p-Value>0.548 in group 2, p-Value>0.840 in group 3, p-Value>0.222 in group 4. Distribution of shape of mental foramen

on left side of mandible across gender and age group was statistically significant in group 5(>65 Years of age), p-Value < 0.027.

Table 6 and Graph 14 shows the distribution of presence of mental foramen on right side of mandible with respect to the anatomical location across gender. Anatomical location of mental foramen was found situated at the apex of first deciduous molar 25(5%) of which 8(1.6%) were males and 17(3.4%) were females. Anatomical location of mental foramen was found situated at the apex of second deciduous molar in 54(10.8%) of which 31 (6.2%) were males and 23(4.6%) were females. Anatomical location of mental foramen was found situated anterior to the apex of first premolar in none of the patients. Anatomical location of mental foramen was found in line with the apex of first premolar in 6(1.2%) of which 2 (0.4%) were males and 4(0.8%) were females. Anatomical location of mental foramen was found situated between the apex of first and second premolar in 88(17.6%) of which 52 (10.4%) were males and 36(7.2%) were females. Anatomical location of mental foramen was found in line with the apex of the second premolar in 307(61.4%) of which 147 (29.4%) were males and 160(32%) were females. Anatomical location of mental foramen was found situated between the apex of second premolar and first molar in 20(4%) of which 10 (2%) were males and 10 (2%) were females. Anatomical location of mental foramen was found situated in line with the apex of first molar in none of the patients. The distribution of presence of mental foramen on right

side of mandible in respective anatomical location across gender was not statistically significant, p-Value > 0.128.

Table 7and Graph 15 shows the distribution of presence of mental foramen on left side of mandible with respect to the anatomical location across gender. Anatomical location of mental foramen was found situated at the apex of first deciduous molar 28(5.6%) of which 13(2.6%) were males and 15(3%) were females. Anatomical location of mental foramen was found situated at the apex of second deciduous molar in 53(10.6%) of which 28 (5.6%) were males and 25(5%) were females. Anatomical location of mental foramen was found situated anterior to the apex of first premolar in none of the patients. Anatomical location of mental foramen was found in line with the apex of first premolar in 4(0.8%) of which 0 (0%) were males and 4 (0.8%) were females. Anatomical location of mental foramen was found situated between the apex of first and second premolar in 58(11.6%) of which 27 (5.4%) were males and 31 (6.2%) were females .Anatomical location of mental foramen was found in line with the apex of the second premolar in 321(64.2%) of which 163 (32.6%) were males and 158 (31.6%) were females. Anatomical location of mental foramen was found situated between the apex of second premolar and first molar in 36(7.2%) of which 19 (3.8%) were males and 17 (3.4%) were females. Anatomical location of mental foramen was found situated in line with the apex of first molar in none of the patients. The distribution of presence of mental foramen on

right side of mandible in respective anatomical location across gender was not statistically significant , p-Value > 0.444.

Table 8 and Graph 16 shows the distribution of presence of mental foramen on right side of mandible with respect to the anatomical location across age group. Anatomical location of mental foramen were found situated at the apex of first deciduous molar in 25(5%) of which all the 25 (5%) of the patients was present in group 1(5-12 years).Anatomical location of mental foramen were found situated at the apex of second deciduous molar in 54(10.8 %) of which all the 54 (10.8%) of the patients were present in group 1(5-12 years).Anatomical location of mental foramen were found anterior to the apex of the first premolar in none of the patients. Anatomical location of mental foramen were found in line with the apex of the first premolar in 6(1.2%) of which 2(0.4%) of the patients were present in group 1(5-12 years), 4(0.8%) in group 2 (13-18 years).Anatomical location of mental foramen were found between the apex of the first and the second premolar in 88 (17.6%) of which 2 (0.4%) of the patients were present in group 1(5-12 years), 22(4.4%) were present in group2 (13-18 Years), 34(6.8%) were present in group 3 (19-40 years of age), 19(3.8%) were present in gruop4 (41-65 years of age) and in 11(2.2%) of in group 5 (> 65 years of age) the patients. Anatomical location of mental foramen were found in line with the apex of the second premolar in 307(61.4%) of which 17 (3.24%) of the patients were present in group 1(5-12 years), 72(14.4%) were present in group2 (13-18 Years), 56(11.2%) were present in group 3

(19-40 years of age), 79(15.8%) were present in gruop4 (41-65 years of age) and in 83(16.6.%) of the patients in group 5 (> 65 years of age) .Anatomical location of mental foramen were found between the apex of second premolar and first molar in 20(4%) of which none of the patients were present in group 1(5-12 years), 2(0.4%) were present in group2 (13-18 Years), 10(2%) were present in group 3 (19-40 years of age), 2(0.4%) were present in group 4 (41-65 years of age) and in 6(1.2%) of the patients in group 5 (> 65 years of age).Anatomical location of mental foramen were found in line with the apex of the first molar in none of the patients in all age groups. The distribution of presence of mental foramen on right side of mandible in respective anatomical location across age group was highly statistically significant, p-Value < 0.000.

Table 9 and Graph 17 shows the Distribution of presence of mental foramen on left side of mandible with respect to the anatomical location across age group. Anatomical location of mental foramen were found situated at the apex of first deciduous molar in 28(5.6%) of which all the 28 (5.6%) of the patients were present in group 1(5-12 years).Anatomical location of mental foramen were found situated at the apex of second deciduous molar in 53(10.6 %) of which all the 53 (10.6%) of the patients were present in group 1(5-12 years).Anatomical location of mental foramen were found anterior to the apex of the first premolar in none of the patients. Anatomical location of mental foramen were found in line with the apex of the first premolar in 4 (0.8%) of which all the 4(0.8%) of the patients were

present in group 2(13-18 years). Anatomical location of mental foramen were found between the apex of the first and the second premolar in 58 (11.6%) of which 7 (1.4%) of the patients were present in group 1(5-12 years), 8(1.6%) were present in group2 (13-18 Years), 24(4.8%) were present in group 3 (19-40 years of age), 11(2.2%) were present in group 4 (41-65 years of age) and in 8(1.6%) of in group 5 (> 65 years of age) the patients. Anatomical location of mental foramen were found in line with the apex of the second premolar in 321(64.2%) of which 12 (2.2%) of the patients were present in group 1(5-12 years), 82(16.4%) were present in group2 (13-18 Years), 66(13.2%) were present in group 3 (19-40 years of age), 81(16.2%) were present in gruop4 (41-65 years of age) and in 80(16.%) of the patients in group 5 (> 65 years of age) .Anatomical location of mental foramen were found between the apex of second premolar and first molar in 36(7.2%) of which none of the patients were present in group 1(5-12 years), 6(1.2%) were present in group2 (13-18 Years), 10(2%) were present in group 3 (19-40 years of age), 8(1.6%) were present in gruop4 (41-65 years of age) and in 12(2.4%) of the patients in group 5 (> 65 years of age).Anatomical location of mental foramen were found in line with the apex of the first molar in none of the patients in all age groups. The distribution of presence of mental foramen on left side of mandible in respective anatomical location across age group was highly statistically significant, p-Value < 0.000.

Table 10 and Graph 18 shows the distribution of the Symmetrical and Asymmetrical Mental foramen of left side as compared with right side across gender. Symmetrical mental foramens were found in 417(83.4%) of the patients of which 203(40.6%) were males and 214(42.8%) were females. Asymmetrical mental foramens were found in 83(16.6%) of the patients of which 47(9.4%) were males and 36(7.2%) were females The distribution of the Symmetrical and Asymmetrical Mental foramen of left side as compared with right side across gender were not statistically significant, p-Value > 0.229.

Table 11 and Graph 19 shows the distribution of the Symmetrical and Asymmetrical Mental foramen of left side as compared with right side across age group. Symmetrical mental foramens were found in 417(83.4%) of which 86 (86%) of the patients were present in group 1(5-12 years), 78(78%) were present in group 2 (13-18 Years), 76(76%) were present in group 3 (19-40 years of age), 86(86%) were present in gruop4 (41-65 years of age) and in 91(91%) of the patients in group 5 (>65 years). Asymmetrical mental foramens were found in 83(16.6%) of which 14 (14%) of the patients were present in group 1(5-12 years), 22(22%) were present in group2 (13-18 Years), 24(24%) were present in group 3 (19-40 years of age), 14(14%) were present in gruop4 (41-65 years of age) and in 9(9%) of the patients in group 5 (>65 years). The distribution of presence of mental foramen on right side of mandible in respective anatomical location across age group was statistically significant, p-Value < 0.024.

Table 12 and Graph 20 shows the distribution of the shape of Mental Foramen on the right side of the mandible across gender. Round mental foramen were found in 225(45%) of which 114 (22.8%) were males and 111 (22.2%) were females. Oval mental foramen were found in 275(55%) of which 136 (27.2%) were males and 139 (27.8%) were females. The distribution of presence of mental foramen on right side of mandible in respective anatomical location across gender was not statistically significant p-Value > 0.429.

Table 13 and Graph 21 shows the distribution of the shape of Mental Foramen on the left side of the mandible across gender. Round mental foramen were found in 237(47.4%) of which 122 (24.4%) were males and 115 (23%) were females Oval mental foramen were found in 263(52.6%) of which 128 (25.6%) were males and 135 (27%) were females. The distribution of presence of mental foramen on right side of mandible in respective anatomical location across gender was not statistically significant p-Value > 0.296.

Table 14 and Graph 22 shows the distribution of the shape of Mental Foramen on the right side of the mandible across age groups. Round mental foramens were found in 225(45%) of which 44 (8.8%) of the patients were present in group 1(5-12 years), 46(9.2%) were present in group 2 (13-18 Years), 58(11.6%) were present in group 3 (19-40 years of age), 37(7.4%) were present in gruop4 (41-65 years of age) and in 40(8%) of the patients in group 5 (>65 years). Oval mental foramens were found in

275(55%) of which 56 (11.2%) of the patients were present in group 1(5-12 years), 54(10.8%) were present in group2 (13-18 Years), 42(8.4%) were present in group 3 (19-40 years of age), 63(12.6%) were present in gruop4 (41-65 years of age) and in 60(12%) of the patients in group 5 (>65 years). The distribution of presence of mental foramen on right side of mandible in respective anatomical location across age group was statistically significant p-Value < 0.033.

Table 15 and Graph 23 shows the distribution of the shape of Mental Foramen on the left side of the mandible across age groups. Round mental foramens were found in237(47.4%) of which 44 (8.8%) of the patients were present in group 1(5-12 years), 48(9.6%) were present in group2 (13-18 Years), 58(11.6%) were present in group 3 (19-40 years of age), 41(8.2%) were present in gruop4 (41-65 years of age) and in 46(9.2%) of the patients in group 5 (>65 years).Oval mental foramens were found in 263 (52.6%) of which 56 (11.2%) of the patients were present in group 1 (5-12 years), 52(10.4%) were present in group2 (13-18 Years), 42(76%) were present in group 3 (19-40 years of age), 59(11.8%) were present in gruop4 (41-65 years of age) and in 64(10.8%) of the patients in group 5 (>65 years). The distribution of presence of mental foramen on right side of mandible in respective anatomical location across age group was not statistically significant, p-Value > 0.152.

Table 16, 17,18,19,20 shows the distribution of the size of the mental foramens in the right and left side of the mandible in age group 1,2,3,4,5 respectively

Table 21 and Graph 24 shows distribution of the mean Size of Mental Foramen across all age groups. The over all mean size of the mental foramen were 0.29cm. The mean size of the mental foramen in group 1 (5-12 years) were 0.242 cm. The mean size of the mental foramen in group 2(13-18 years) were 0.296 cm. The mean size of the mental foramen in group 3(19-40 years) were 0.333 cm. The mean size of the mental foramen in group 4(41-65 years) were 0.305 cm. The mean size of the mental foramen in group 5(>65 years) were 0.273 cm. The distribution of the mean Size of Mental Foramen across all age groups was statistically highly significant, p-Value < 0.00

Table 22 shows distribution of the mean size of Mental Foramen across age groups on the right and left side**.** The mean size of the foramen in age group 1 of 5-12 years were 0.24 cm in the right side and 0.245cm in the left side. The mean size of the foramen in age group 2 of 13-18 years was 0.29 cm in the right side and 0.302 cm in the left side. The mean size of the foramen in age group 3 of 19-40 years were 0.324 cm in the right side and 0.342 cm in the left side. The mean size of the foramen in age group 4 of 41-65 years were 0.305cm in the right side and 0.306 cm in the left side. The mean size of the foramen in age group 5(> 65 years) were 0.273 cm in the right side and left side. The total mean size of the mental foramen of all

the samples across age group on the right side were 0.2864 cm and on the left side were 0.2936 cm. The distribution of the Size of Mental Foramen across all age groups was statistically highly significant, p-Value< 0.00

Table 23 and Graph 25 shows the distribution of the Mean Size of Mental Foramen across gender on the right and left side. The Mean size of the mental foramen on the right side in males was 0.248 cm and in females were 0.232cm. The Mean size of the mental foramen in the left side was 0.252 cm in males and 0.238 cm in females. The mean size of the right and left mental foramen in males were 0.25 cms and in females were 0.235 cms. The distribution of the Size of Mental Foramen on the right and left side of the mandible across gender was statistically highly significant, p-Value <0.00.

Table 1: Distribution of presence of mental foramen in the right side of mandible across gender and age group

Age group	Presence of the Mental foramen	No. of patients		
		Male n(%)	**Female n(%)**	**Total n(%)**
Group 1 (5-12 years)	1) Situated at the apex of first deciduous molar	8(8%)	17(17%)	25(25%)
	2) Situated at the apex of second deciduous molar	31(31%)	23(23%)	54(54%)
	3) Situated anterior to the apex of first premolar	0	0	0
	4) In line with the apex of first premolar.	2(2%)	0	2(2%)
	5) Between the apex of first and second premolars	0	2(2%)	2(2%)
	6) In line with the apex of second premolar	9(9%)	8(8%)	17(17%)
	7) Between the apex of second premolar and first molar	0	0	0
	8) In line with the apex of first molar	0	0	0

Chi-Squared Test

p-Value > 0.75 (Not Significant)

Table 1: Cont'd
Distribution of presence of mental foramen in the right side of mandible across gender and age group

Age group	Presence of the Mental foramen	No. of patients		
		Male n(%)	**Female n(%)**	**Total n(%)**
Group 2 (13-18 years)	1) Situated at the apex of first deciduous molar	0	0	0
	2) Situated at the apex of second deciduous molar	0	0	0
	3) Situated anterior to the apex of first premolar	0	0	0
	4) In line with the apex of first premolar.	0	4(4%)	4(4%)
	5) Between the apex of first and second premolars	14(14%)	8(8%)	22(22%)
	6) In line with the apex of second premolar	36(36%)	36(36%)	72(72%)
	7) Between the apex of second premolar and first molar	0	2(2%)	2(2%)
	8) In line with the apex of first molar	0	0	0

Chi-Squared Test

p-Value < 0.05 (Significant)

Table 1: Cont'd
Distribution of presence of mental foramen in the right side of mandible across gender and age group

Age group	Presence of the Mental foramen	No. of patients		
		Male n(%)	**Female n(%)**	**Total n(%)**
Group 3 (19-40 years)	1) Situated at the apex of first deciduous molar	0	0	0
	2) Situated at the apex of second deciduous molar	0	0	0
	3) Situated anterior to the apex of first premolar	0	0	0
	4) In line with the apex of first premolar.	0	0	0
	5) Between the apex of first and second premolars	18(18%)	16(16%)	34(34%)
	6) In line with the apex of second premolar	26(26%)	30(30%)	56(56%)
	7) Between the apex of second premolar and first molar	6(6%)	4(4%)	10(10%)
	8) In line with the apex of first molar	0	0	0

Chi-Squared Test
p-Value > 0.66 (Not Significant)

Table 1: Cont'd
Distribution of presence of mental foramen in the right side of mandible across gender and age group

Age group	Presence of the Mental foramen	No. of patients		
		Male n(%)	**Female n(%)**	**Total n(%)**
Group 4 (41-65 years)	1) Situated at the apex of first deciduous molar	0	0	0
	2) Situated at the apex of second deciduous molar	0	0	0
	3) Situated anterior to the apex of first premolar	0	0	0
	4) In line with the apex of first premolar.	0	0	0
	5) Between the apex of first and second premolars	13(13%)	6(6%)	19(19%)
	6) In line with the apex of second premolar	35(35%)	44(44%)	79(79%)
	7) Between the apex of second premolar and first molar	2(2%)	0	2(2%)
	8) In line with the apex of first molar	0	0	0

Chi-Squared Test
p-Value > 0.06 (Not Significant)

Table 1: Cont'd
Distribution of presence of mental foramen in the right side of mandible across gender and age group

Age group	Presence of the Mental foramen	No. of patients		
		Male n(%)	**Female n(%)**	**Total n(%)**
Group 5 >65 years)	1) Situated at the apex of first deciduous molar	0	0	0
	2) Situated at the apex of second deciduous molar	0	0	0
	3) Situated anterior to the apex of first premolar	0	0	0
	4) In line with the apex of first premolar.	0	0	0
	5) Between the apex of first and second premolars	7(7%)	4(4%)	11(11%)
	6) In line with the apex of second premolar	41(41%)	42(42%)	83(83%)
	7) Between the apex of second premolar and first molar	2(2%)	4(4%)	6(6%)
	8) In line with the apex of first molar	0	0	0

Chi-Squared Test
p-Value > 0.47 (Not Significant)

Table 2: Distribution of presence of mental foramen in the Left side of mandible across gender and age group

Age group	Presence of the Mental foramen	No. of patients		
		Male n(%)	**Female n(%)**	**Total n(%)**
Group 1 (5-12 years)	1) Situated at the apex of first deciduous molar	13(13%)	15(15%)	28(28%)
	2) Situated at the apex of second deciduous molar	28(28%)	25(25%)	53(53%)
	3) Situated anterior to the apex of first premolar	0	0	0
	4) In line with the apex of first premolar.	0	0	0
	5) Between the apex of first and second premolars	3(3%)	4(4%)	7(7%)
	6) In line with the apex of second premolar	6(6%)	6(6%)	12(12%)
	7) Between the apex of second premolar and first molar	0	0	0
	8) In line with the apex of first molar	0	0	0

Chi-Square Test
p-Value > 0.92 (Not Significant)

Table 2: Cont'd
Distribution of presence of mental foramen in the Left side of mandible across gender and age group

Age group	Presence of the Mental foramen	No. of patients		
		Male n(%)	**Female n(%)**	**Total n(%)**
Group 2 (13-18 years)	1) Situated at the apex of first deciduous molar	0	0	0
	2) Situated at the apex of second deciduous molar	0	0	0
	3) Situated anterior to the apex of first premolar	0	0	0
	4) In line with the apex of first premolar.	0	4(4%)	4(4%)
	5) Between the apex of first and second premolars	6(6%)	2(2%)	8(8%)
	6) In line with the apex of second premolar	44(44%)	38(38%)	82(82%)
	7) Between the apex of second premolar and first molar	0	6(6%)	6(6%)
	8) In line with the apex of first molar	0	0	0

Chi-Square Test
p-Value > 0.06 (Not Significant)

Table 2: Cont'd
Distribution of presence of mental foramen in the Left side of mandible across gender and age group

Age group	Presence of the Mental foramen	No. of patients		
		Male n(%)	**Female n(%)**	**Total n(%)**
Group 3 (19-40 years)	1) Situated at the apex of first deciduous molar	0	0	0
	2) Situated at the apex of second deciduous molar	0	0	0
	3) Situated anterior to the apex of first premolar	0	0	0
	4) In line with the apex of first premolar.	0	0	0
	5) Between the apex of first and second premolars	6(6%)	18(18%)	24(24%)
	6) In line with the apex of second premolar	38(38%)	28(28%)	66(66%)
	7) Between the apex of second premolar and first molar	6(6%)	4(4%)	10(10%)
	8) In line with the apex of first molar	0	0	0

Chi-Square Test
p-Value < 0.019 (Significant)

Table 2: Cont'd
Distribution of presence of mental foramen in the Left side of mandible across gender and age group

Age group	Presence of the Mental foramen	No. of patients		
		Male n(%)	**Female n(%)**	**Total n(%)**
Group 4 (41-65 years)	1) Situated at the apex of first deciduous molar	0	0	
	2) Situated at the apex of second deciduous molar	0	0	
	3) Situated anterior to the apex of first premolar	0	0	
	4) In line with the apex of first premolar.	0	0	
	5) Between the apex of first and second premolars	7(7%)	4(4%)	11(11%)
	6) In line with the apex of second premolar	38(38%)	43(43%)	81(81%)
	7) Between the apex of second premolar and first molar	5(5%)	3(3%)	8(8%)
	8) In line with the apex of first molar	0	0	0

Chi-Square Test
p-Value > 0.44 (Not Significant)

Table 2: Cont'd
Distribution of presence of mental foramen in the Left side of mandible across gender and age group

Age group	Presence of the Mental foramen	No. of patients		
		Male n(%)	**Female n(%)**	**Total n(%)**
Group 5 (>65 years)	1) Situated at the apex of first deciduous molar	0	0	0
	2) Situated at the apex of second deciduous molar	0	0	0
	3) Situated anterior to the apex of first premolar	0	0	0
	4) In line with the apex of first premolar.	0	0	0
	5) Between the apex of first and second premolars	5(5%)	3(3%)	8(8%)
	6) In line with the apex of second premolar	37(37%)	43(43%)	80(80%)
	7) Between the apex of second premolar and first molar	8(8%)	4(4%)	12(12%)
	8) In line with the apex of first molar	0	0	0

Chi-Square Test
p-Value > 0.31 (Not Significant)

Table 3: Distribution of symmetry of mental foramen of the Left side as compared with the right side across age group

S.No	Age group	Symmetry of The Foramen		p-Value Chi-Square Test
		Symmetrical	Asymmetrical	
1.	Group1 (5-12 Years)	**86**	**14**	**0.074***
2.	Group2 (13-18 years)	**78**	**22**	**0.114***
3.	Group3 (19-40 years)	**76**	**24**	**0.592***
4.	Group4 (41-65 years)	**86**	**14**	**0.194***
5.	Group5 (>65 years)	**91**	**9**	**0.015****
6.	Total	**417**	**83**	

Chi-Square test

***p-Value > 0.5 (Not Significant)**

****p-Value< 0.5 (Significant)**

Table 4: Distribution of shape of mental foramen on right side of mandible across gender and age group

S.No	Age group	Shape of The Foramen						p-Value Chi-Square Test
		Round			Oval			
		Male N(%)	Female N(%)	Total N(%)	Male N(%)	Female N(%)	Total N(%)	
1.	Group 1 (5-12 Years)	20	24	44	30	26	56	0.546*
2.	Group 2 (13-18 years)	24	22	46	26	28	54	0.841*
3.	Group 3 (19-40 years)	32	26	58	18	24	42	0.311*
4.	Group 4 (41-65 years)	15	22	37	35	28	63	0.214*
5.	Group 5 (>65 years)	23	17	40	27	33	60	0.307*

***p-Value > 0.5 (Not Significant)**

****p-Value< 0.5 (Significant)**

Table 5 :Distribution of shape of mental foramen on left side of mandible across gender and age group

S.No	Age group	Shape of The Foramen						p-Value Chi-Square Test
		Round			Oval			
		Male N(%)	Female N(%)	Total N(%)	Male N(%)	Female N(%)	Total N(%)	
1.	Group 1 (5-12 Years)	20	24	44	30	26	56	0.546*
2.	Group 2 (13-18 years)	26	22	48	24	28	52	0.548*
3.	Group 3 (19-40 years)	30	28	58	20	22	42	0.840*
4.	Group 4 (41-65 years)	17	24	41	33	26	59	0.222*
5.	Group 5 (>65 years)	29	17	46	21	33	54	0.027**

***p-Value > 0.5 (Not Significant)**

****p-Value< 0.5 (Significant)**

Table 6 :Distribution of presence of mental foramen on right side of mandible with respect to the anatomical location across gender

Anatomical Location of Mental Foramen	**Gender**		
	Male N(%)	**Female N(%)**	**Total**
1.Situated at the apex of first deciduous molar	8(1.6%)	17(3.4%)	25(5%)
2.Situated at the apex of second deciduous molar	31(6.2%)	23(4.6%)	54(10.8%)
3.Situated anterior to the apex of first premolar	0	0	0
4.In line with the apex of first premolar.	2(0.4%)	4(0.8%)	6(1.2%)
5.Between the apex of first and second premolars	52(10.4%)	36(7.2%)	88(17.6%)
6.In line with the apex of second premolar	147(29.4%)	160(32%)	307(61.4%)
7.Between the apex of second premolar and first molar	**10(2%)**	**10(2%)**	**20(4%)**
8.In line with the apex of first molar	0	0	0

Chi-Square Test

p-Value > 0.128 (Not Significant)

Table 7 :Distribution of presence of mental foramen on left side of mandible with respect to the anatomical location across gender

Anatomical Location of Mental Foramen	Gender		
	Male N(%)	**Female N(%)**	**Total N(%)**
1.Situated at the apex of first deciduous molar	13(2.6%)	15(3%)	28(5.6%)
2. Situated at the apex of second deciduous molar	28(5.6%)	25(5%)	53(10.6%)
3.Situated anterior to the apex of first premolar	0	0	0
4.In line with the apex of first premolar.	0	4(.8%)	4(0.8%)
5.Between the apex of first and second premolars	27(5.4%)	31(6.2%)	58(11.6%)
6.In line with the apex of second premolar	163(32.6%)	158(31.6%)	321(64.2%)
7.Between the apex of second premolar and first molar	19(3.8%)	17(3.4%)	36(7.2%)
8.In line with the apex of first molar	0	0	0

Chi-Square Test

p-Value > 0.444 (Not Significant)

Table 8: Distribution of presence of mental foramen on right side of mandible with respect to anatomical location across age group

Anatomical Location of Mental Foramen	Age Groups					
	5-12 yrs	13-18 yrs	18-40 yrs	41-65 yrs	>65 yrs	Total
Situated at the apexof first deciduous molar	25 (5%)	0	0	0	0	25 (5%)
Situated at the apex of second deciduous molar	54 (10.8%)	0	0	0	0	54 (10.8%)
Situated anterior to The apex of first premolar	0	0	0	0	0	0
In line with the apex of first premolar.	2 (0.4%)	4 (0.8%)	0	0	0	6 (1.2%)
Between the apex of first and second premolars	2 (0.4%)	22 (4.4%)	34 (6.8%)	19 (3.8%)	11 (2.2%)	88 (17.6)
In line with the apex of second premolar	17 (3.4%)	72 (14.4%)	56 (11.2%)	79 (15.8%)	83 (16.6 %)	307 (61.4%)
Between the apex of second premolar and first molar	0	2 (0.4%)	10 (2%)	2 (0.4%)	6 (1.2%)	20 (4%)
In line with the apex of first molar	0	0	0	0	0	0

Chi-Square Test
p-Value < 0.000 (Highly Significant)

Table 9:Distribution of presence of mental foramen on left side of mandible with respect to anatomical location across age group

Anatomical Location of Mental Foramen	Age Groups					
	5-12 yrs	**13-18 yrs**	**18-40 yrs**	**41-65 yrs**	**>65 yrs**	**Total**
Situated at the apex of first deciduous molar	28 (5.6%)	0	0	0	0	28 (5.6%)
Situated at the apex of second deciduous molar	53 (10.6%)	0	0	0	0	53 (10.6%)
Situated anterior to The apex of first premolar	0	0	0	0	0	0
In line with the apex of first premolar.	0 (0.4%)	4 (0.8%)	0	0	0	4 (0.8%)
Between the apex of first and second premolars	7 (1.4%)	8 (1.6%)	24 (4.8%)	11 (2.2%)	8 (1.6%)	58 (11.6)
In line with the apex of second premolar	12 (2.2%)	82 (16.4%)	66 (13.2%)	81 (16.2%)	80 (16%)	321 (64.2%)
Between the apex of second premolar and first molar	0	6 (1.2%)	10 (2%)	8 (1.6%)	12 (2.4%)	36 (7.2%)
In line with the apex Of first molar	0	0	0	0	0	0

Chi-Square Test
p-Value < 0.000 (Highly Significant)

Table 10:Distribution of the symmetrical and asymmetrical Mental foramen of left side as compared with right side across gender

S no	Symmetry of The Foramen	Gender		
		Male	**Female**	**Total**
1.	Symmetrical	203 (40.6%)	214 (42.8%)	417 (83.4%)
2.	Asymmetrical	47 (9.4%)	36 (7.2%)	83 (16.6%)
	Total	250 (50%)	250 (50%)	500 100%)

Chi-Square Test
p-Value> 0.229 (Not Significant)

Table 11: Distribution of the symmetrical and asymmetrical Mental foramen of left side as compared with right side across age group

S No	Symmetry of The Foramen	Age group					
		5-12 yrs	**13-18 yrs**	**19-40 yrs**	**41-65 yrs**	**>65 yrs**	**Total**
1.	Symmetrical	86 (86%)	78 (78%)	76 (76%)	86 (86%)	91 (91%)	417 (83.4%)
2.	Asymmetrical	14 (14%)	22 (22%)	24 (24%)	14 (14%)	9 (9%)	83 (16.6%)

Chi-Square Test

p-Value< 0.024 (Significant)

Table 12:Distribution of the shape of Mental Foramen on the right side of the mandible across gender

S.No	Shape of the Foramen	Gender		
		Male	**Female**	**Total**
1.	Round	114 (22.8%)	111 (22.2%)	225 (45%)
2.	Oval	136 (27.2%)	139 (27.8%)	275 (55%)
	Total	250	250	500

Chi-Square Test

p-Value > 0.429 (Not Significant)

Table 13:Distribution of the shape of Mental Foramen on the left side of the mandible across gender

S.No	Shape of the Foramen	Gender		
		Male	**Female**	**Total**
1.	Round	122 (24.4%)	115 (23%)	237 (47.4%)
2.	Oval	128 (25.6%)	135 (27%)	263 (52.6%)

Chi-Square Test

p-Value> 0.296 (Not Significant)

Table 14:Distribution of the shape of Mental Foramen on the right side of the mandible across age groups

S.No	Shape of the Foramen	Age group					
		5-12 yrs	**13-18 yrs**	**19-40 yrs**	**41-65 yrs**	**>65 yrs**	**Total**
1.	Round	44 (8.8%)	46 (9.2%)	58 (11.6%)	37 (7.4%)	40 (8%)	225 (45%)
2.	Oval	56 (11.2%)	54 (10.8%)	42 (8.4%)	63 (12.6%)	60 (12%)	275 (55%)

Chi-Square Test
p-Value< 0.033 (Significant)

Table 15:Distribution of the shape of Mental Foramen on the left side of the mandible across age groups

S.No	Shape of the Foramen	Age group					
		5-12 yrs	**13-18 yrs**	**19-40 yrs**	**41-65 yrs**	**>65 yrs**	**Total**
1.	Round	44 (8.8%)	48 (9.6%)	58 (11.6%)	41 (8.2%)	46 (9.2%)	237 (47.4%)
2.	Oval	56 (11.2%)	52 (10.4%)	42 (8.4%)	59 (11.8%)	64 (10.8%)	263 (52.6%)

Chi-Square Test
p-Value > 0.152 (Not Significant)

Table16: Distribution of the size of mental foramen in age group 1

S.No	Size of the mental foramen on the left side in cm	Size of the mental foramen on the right side in cm
1	0.2	0.2
2	0.3	0.3
3	0.2	0.2
4	0.3	0.3
5	0.2	0.2
6	0.2	0.2
7	0.2	0.2
8	0.2	0.3
9	0.2	0.2
10	0.2	0.2
11	0.4	0.4
12	0.2	0.2
13	0.4	0.4
14	0.3	0.3
15	0.4	0.5
16	0.2	0.2
17	0.2	0.2
18	0.3	0.2
19	0.2	0.2
20	0.2	0.2
21	0.3	0.3
22	0.2	0.2
23	0.2	0.2
24	0.3	0.3
25	0.2	0.2
26	0.3	0.3
27	0.2	0.2
28	0.2	0.2
29	0.2	0.2
30	0.2	0.3
31	0.2	0.2
32	0.2	0.2
33	0.4	0.4
34	0.2	0.2
35	0.4	0.4
36	0.3	0.3

S.No	**size of the mental foramen on the left side in cm**	**Size of the mental foramen on the right side in cm**
37	0.4	0.5
38	0.2	0.2
39	0.2	0.2
40	0.3	0.2
41	0.2	0.2
42	0.2	0.2
43	0.3	0.3
44	0.2	0.2
45	0.2	0.2
46	0.3	0.3
47	0.2	0.2
48	0.3	0.3
49	0.2	0.2
50	0.2	0.2
51	0.2	0.2
52	0.3	0.3
53	0.2	0.2
54	0.2	0.2
55	0.3	0.3
56	0.2	0.3
57	0.2	0.2
58	0.2	0.2
59	0.3	0.3
60	0.3	0.4
61	0.2	0.2
62	0.2	0.2
63	0.2	0.2
64	0.2	0.2
65	0.3	0.3
66	0.3	0.2
67	0.2	0.2
68	0.2	0.2
69	0.2	0.2
70	0.2	0.2
71	0.3	0.3
72	0.2	0.2
73	0.2	0.2
74	0.3	0.3

S.No	size of the mental foramen on the left side in cm	Size of the mental foramen on the right side in cm
75	0.2	0.2
76	0.2	0.2
77	0.3	0.3
78	0.2	0.3
79	0.2	0.2
80	0.2	0.2
81	0.3	0.3
82	0.3	0.4
83	0.2	0.2
84	0.2	0.2
85	0.2	0.2
86	0.2	0.2
87	0.3	0.3
88	0.3	0.2
89	0.2	0.2
90	0.2	0.2
91	0.2	0.2
92	0.2	0.2
93	0.3	0.3
94	0.2	0.2
95	0.2	0.2
96	0.3	0.3
97	0.2	0.2
98	0.2	0.2
99	0.3	0.3
100	0.2	0.3

Table 17: Distribution of the size of mental foramen in age group 2

S.No	size of the mental foramen on the left side in cm	Size of the mental foramen on the right side in cm
1	0.2	0.3
2	0.3	0.2
3	0.2	0.2
4	0.3	0.3
5	0.2	0.2
6	0.2	0.3
7	0.2	0.2
8	0.2	0.2
9	0.2	0.2
10	0.2	0.2
11	0.4	0.4
12	0.2	0.2
13	0.4	0.4
14	0.3	0.3
15	0.4	0.5
16	0.2	0.2
17	0.2	0.3
18	0.3	0.2
19	0.2	0.2
20	0.2	0.3
21	0.3	0.2
22	0.2	0.3
23	0.2	0.2
24	0.3	0.2
25	0.2	0.2
26	0.3	0.3
27	0.2	0.2
28	0.2	0.2
29	0.2	0.2
30	0.2	0.3
31	0.2	0.2
32	0.2	0.2
33	0.4	0.4
34	0.2	0.2
35	0.4	0.4
36	0.3	0.3

S.No	size of the mental foramen on the left side in cm	Size of the mental foramen on the right side in cm
37	0.4	0.5
38	0.2	0.2
39	0.2	0.2
40	0.3	0.2
41	0.2	0.2
42	0.2	0.2
43	0.3	0.3
44	0.2	0.2
45	0.2	0.2
46	0.3	0.3
47	0.2	0.2
48	0.3	0.3
49	0.2	0.2
50	0.2	0.2
51	0.2	0.3
52	0.3	0.2
53	0.2	0.3
54	0.2	0.2
55	0.3	0.2
56	0.2	0.2
57	0.2	0.2
58	0.2	0.2
59	0.3	0.3
60	0.3	0.4
61	0.2	0.2
62	0.2	0.2
63	0.2	0.2
64	0.2	0.2
65	0.3	0.3
66	0.3	0.2
67	0.2	0.2
68	0.2	0.2
69	0.2	0.2
70	0.2	0.2
71	0.3	0.3
72	0.2	0.2
73	0.2	0.2
74	0.3	0.3

S.No	size of the mental foramen on the left side in cm	Size of the mental foramen on the right side in cm
75	0.2	0.2
76	0.2	0.2
77	0.3	0.3
78	0.2	0.3
79	0.2	0.2
80	0.2	0.2
81	0.3	0.3
82	0.3	0.3
83	0.2	0.2
84	0.2	0.2
85	0.2	0.3
86	0.2	0.2
87	0.3	0.3
88	0.3	0.2
89	0.2	0.2
90	0.2	0.2
91	0.2	0.2
92	0.2	0.2
93	0.3	0.3
94	0.2	0.2
95	0.2	0.2
96	0.3	0.3
97	0.2	0.2
98	0.2	0.2
99	0.3	0.3
100	0.2	0.3

Table 18: Distribution of the size of mental foramen in age group 3

S.No	size of the mental foramen on the left side in cm	Size of the mental foramen on the right side in cm
1	0.2	0.3
2	0.3	0.4
3	0.2	0.3
4	0.3	0.2
5	0.2	0.2
6	0.2	0.3
7	0.2	0.2
8	0.2	0.3
9	0.2	0.2
10	0.2	0.2
11	0.4	0.4
12	0.2	0.2
13	0.4	0.4
14	0.3	0.3
15	0.4	0.5
16	0.2	0.2
17	0.2	0.2
18	0.3	0.2
19	0.2	0.2
20	0.2	0.2
21	0.3	0.3
22	0.2	0.2
23	0.2	0.2
24	0.3	0.3
25	0.2	0.2
26	0.3	0.3
27	0.2	0.2
28	0.2	0.2
29	0.2	0.2
30	0.2	0.3
31	0.2	0.2
32	0.2	0.2
33	0.4	0.4
34	0.2	0.2
35	0.4	0.4
36	0.3	0.3

S.No	size of the mental foramen on the left side in cm	Size of the mental foramen on the right side in cm
37	0.4	0.5
38	0.2	0.2
39	0.2	0.3
40	0.3	0.2
41	0.2	0.2
42	0.2	0.3
43	0.3	0.2
44	0.2	0.3
45	0.2	0.2
46	0.3	0.2
47	0.2	0.2
48	0.3	0.3
49	0.2	0.2
50	0.2	0.2
51	0.2	0.3
52	0.3	0.2
53	0.2	0.2
54	0.2	0.3
55	0.3	0.2
56	0.2	0.3
57	0.2	0.2
58	0.2	0.2
59	0.3	0.3
60	0.3	0.4
61	0.2	0.2
62	0.2	0.2
63	0.2	0.2
64	0.2	0.2
65	0.3	0.3
66	0.3	0.3
67	0.2	0.2
68	0.2	0.2
69	0.2	0.3
70	0.2	0.2
71	0.3	0.3
72	0.2	0.2
73	0.2	0.2
74	0.3	0.3

S.No	size of the mental foramen on the left side in cm	Size of the mental foramen on the right side in cm
75	0.2	0.2
76	0.2	0.2
77	0.3	0.3
78	0.2	0.3
79	0.2	0.2
80	0.2	0.2
81	0.3	0.3
82	0.3	0.4
83	0.2	0.3
84	0.2	0.2
85	0.2	0.2
86	0.2	0.3
87	0.3	0.2
88	0.3	0.3
89	0.2	0.2
90	0.2	0.2
91	0.2	0.2
92	0.2	0.2
93	0.3	0.3
94	0.2	0.2
95	0.2	0.2
96	0.3	0.3
97	0.2	0.2
98	0.2	0.2
99	0.3	0.3
100	0.2	0.3

Table 19: Distribution of the size of mental foramen in age group 4

S.No	size of the mental foramen on the left side in cm	Size of the mental foramen on the right side in cm
1	0.2	0.2
2	0.3	0.3
3	0.2	0.2
4	0.3	0.3
5	0.2	0.2
6	0.2	0.2
7	0.2	0.2
8	0.2	0.3
9	0.2	0.2
10	0.2	0.2
11	0.4	0.4
12	0.2	0.2
13	0.4	0.4
14	0.3	0.3
15	0.4	0.5
16	0.2	0.2
17	0.2	0.2
18	0.3	0.2
19	0.2	0.2
20	0.2	0.2
21	0.3	0.3
22	0.2	0.2
23	0.2	0.2
24	0.3	0.3
25	0.2	0.3
26	0.3	0.2
27	0.2	0.2
28	0.2	0.3
29	0.2	0.2
30	0.2	0.3
31	0.2	0.2
32	0.2	0.2
33	0.4	0.4
34	0.2	0.2
35	0.4	0.4
36	0.3	0.3

S.No	size of the mental foramen on the left side in cm	Size of the mental foramen on the right side in cm
37	0.4	0.5
38	0.2	0.2
39	0.2	0.2
40	0.3	0.2
41	0.2	0.2
42	0.2	0.2
43	0.3	0.3
44	0.2	0.2
45	0.2	0.2
46	0.3	0.3
47	0.2	0.2
48	0.3	0.3
49	0.2	0.2
50	0.2	0.2
51	0.2	0.2
52	0.3	0.3
53	0.2	0.2
54	0.2	0.2
55	0.3	0.3
56	0.2	0.3
57	0.2	0.2
58	0.2	0.2
59	0.3	0.3
60	0.3	0.4
61	0.2	0.2
62	0.2	0.2
63	0.2	0.2
64	0.2	0.2
65	0.3	0.3
66	0.3	0.2
67	0.2	0.2
68	0.2	0.2
69	0.2	0.2
70	0.2	0.2
71	0.3	0.3
72	0.2	0.2
73	0.2	0.2
74	0.3	0.3

S.No	size of the mental foramen on the left side in cm	Size of the mental foramen on the right side in cm
75	0.2	0.2
76	0.2	0.2
77	0.3	0.3
78	0.2	0.3
79	0.2	0.3
80	0.2	0.2
81	0.3	0.2
82	0.3	0.3
83	0.2	0.2
84	0.2	0.3
85	0.2	0.2
86	0.2	0.2
87	0.3	0.2
88	0.3	0.2
89	0.2	0.2
90	0.2	0.2
91	0.2	0.2
92	0.2	0.2
93	0.3	0.3
94	0.2	0.2
95	0.2	0.2
96	0.3	0.3
97	0.2	0.2
98	0.2	0.2
99	0.3	0.3
100	0.2	0.3

Table 20: Distribution of the size of mental foramen in age group 5

S.No	size of the mental foramen on the left side in cm	Size of the mental foramen on the right side in cm
1	0.2	0.3
2	0.3	0.4
3	0.2	0.2
4	0.3	0.4
5	0.2	0.2
6	0.2	0.3
7	0.2	0.2
8	0.2	0.2
9	0.2	0.2
10	0.2	0.3
11	0.4	0.4
12	0.2	0.2
13	0.4	0.4
14	0.3	0.3
15	0.4	0.5
16	0.2	0.2
17	0.2	0.2
18	0.3	0.2
19	0.2	0.2
20	0.2	0.2
21	0.3	0.3
22	0.2	0.2
23	0.2	0.2
24	0.3	0.3
25	0.2	0.2
26	0.3	0.3
27	0.2	0.2
28	0.2	0.2
29	0.2	0.2
30	0.2	0.3
31	0.2	0.2
32	0.2	0.2
33	0.4	0.4
34	0.2	0.2
35	0.4	0.4
36	0.3	0.3

S.No	size of the mental foramen on the left side in cm	Size of the mental foramen on the right side in cm
37	0.4	0.5
38	0.2	0.2
39	0.2	0.2
40	0.3	0.2
41	0.2	0.2
42	0.2	0.2
43	0.3	0.3
44	0.2	0.2
45	0.2	0.2
46	0.3	0.3
47	0.2	0.3
48	0.3	0.2
49	0.2	0.2
50	0.2	0.3
51	0.2	0.2
52	0.3	0.3
53	0.2	0.2
54	0.2	0.2
55	0.3	0.3
56	0.2	0.3
57	0.2	0.2
58	0.2	0.2
59	0.3	0.3
60	0.3	0.4
61	0.2	0.2
62	0.2	0.2
63	0.2	0.2
64	0.2	0.2
65	0.3	0.3
66	0.3	0.2
67	0.2	0.2
68	0.2	0.2
69	0.2	0.2
70	0.2	0.2
71	0.3	0.3
72	0.2	0.2
73	0.2	0.2
74	0.3	0.3

S.No	size of the mental foramen on the left side in cm	Size of the mental foramen on the right side in cm
75	0.2	0.2
76	0.2	0.2
77	0.3	0.3
78	0.2	0.3
79	0.2	0.2
80	0.2	0.2
81	0.3	0.3
82	0.3	0.4
83	0.2	0.2
84	0.2	0.3
85	0.2	0.2
86	0.2	0.2
87	0.3	0.3
88	0.3	0.2
89	0.2	0.3
90	0.2	0.2
91	0.2	0.2
92	0.2	0.2
93	0.3	0.3
94	0.2	0.2
95	0.2	0.2
96	0.3	0.3
97	0.2	0.2
98	0.2	0.2
99	0.3	0.3
100	0.2	0.3

Table 21: Distribution of the Mean Size of Mental Foramen across all groups

S.No	Size of The Foramen In all groups and gender (n=500)	Mean Size in cm						p-Value ANOVA
		5-12 yrs (n=100)	13-18 yrs (n=100)	19-40yrs (n=100)	41-65yrs (n=100)	>65 yrs (n=100)	Total (n=500)	
	Mean size	**0.242**	**0.296**	**0.333**	**0.305**	**0.273**	**0.29**	**0.00****

Anova
**** (Highly Significant)**

Table 22:Distribution of the Size of Mental Foramen across age groups on the right and left side

S.No	Size of The Foramen	Mean Size in cm						p-Value ANOVA
		5-12 yrs (n=100)	13-18 yrs (n=100)	19-40yrs (n=100)	41-65yrs (n=100)	>65 yrs (n=100)	Total (n=500)	
1.	Right	**0.24**	**0.29**	**0.324**	**0.305**	**0.273**	**0.2864**	**0.000***
2.	Left	**0.245**	**0.302**	**0.342**	**0.306**	**0.273**	**0.2936**	**0.000***

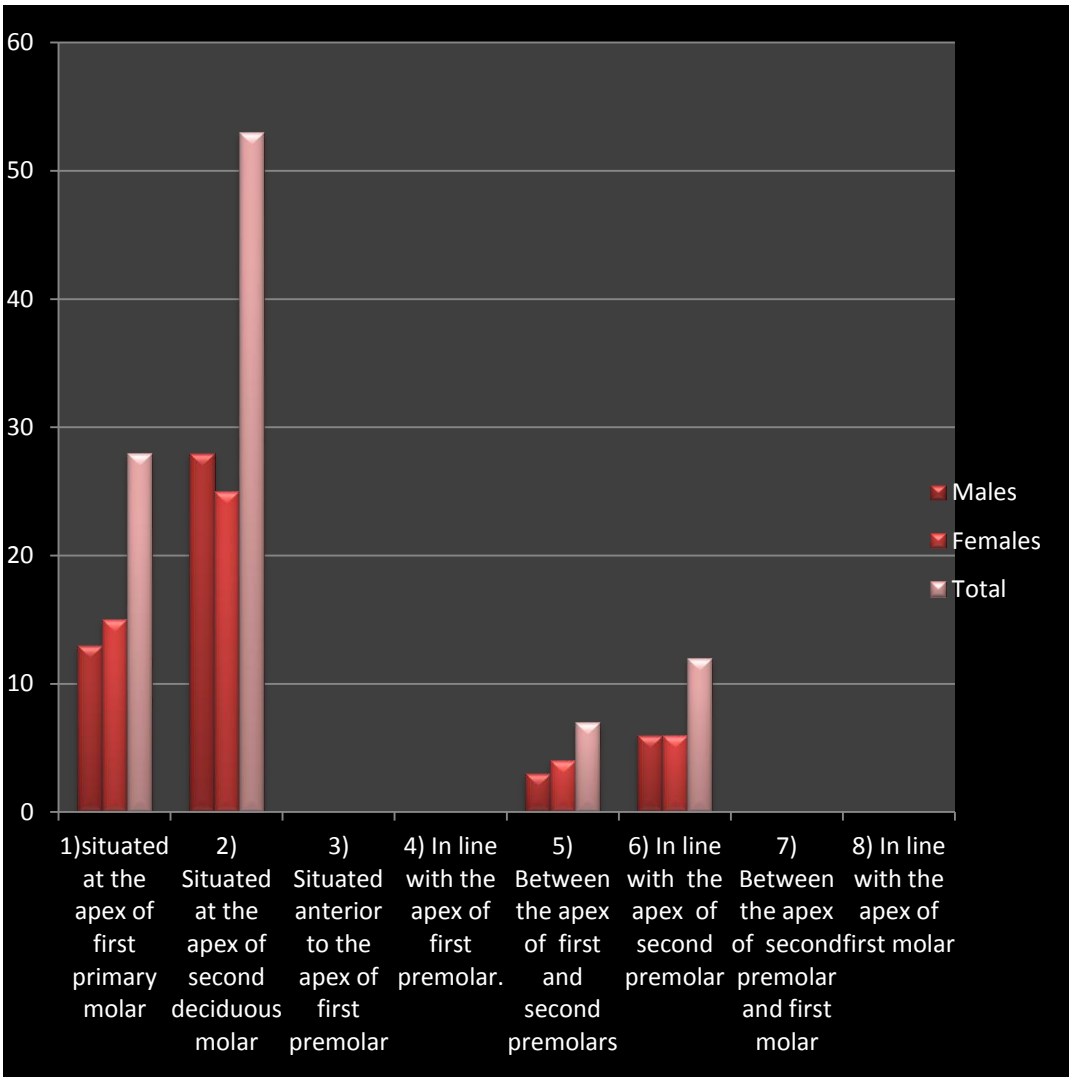
Anova
**** (Highly Significant)**

Table 23: Distribution of the Size of Mental Foramen across gender on the right and left side

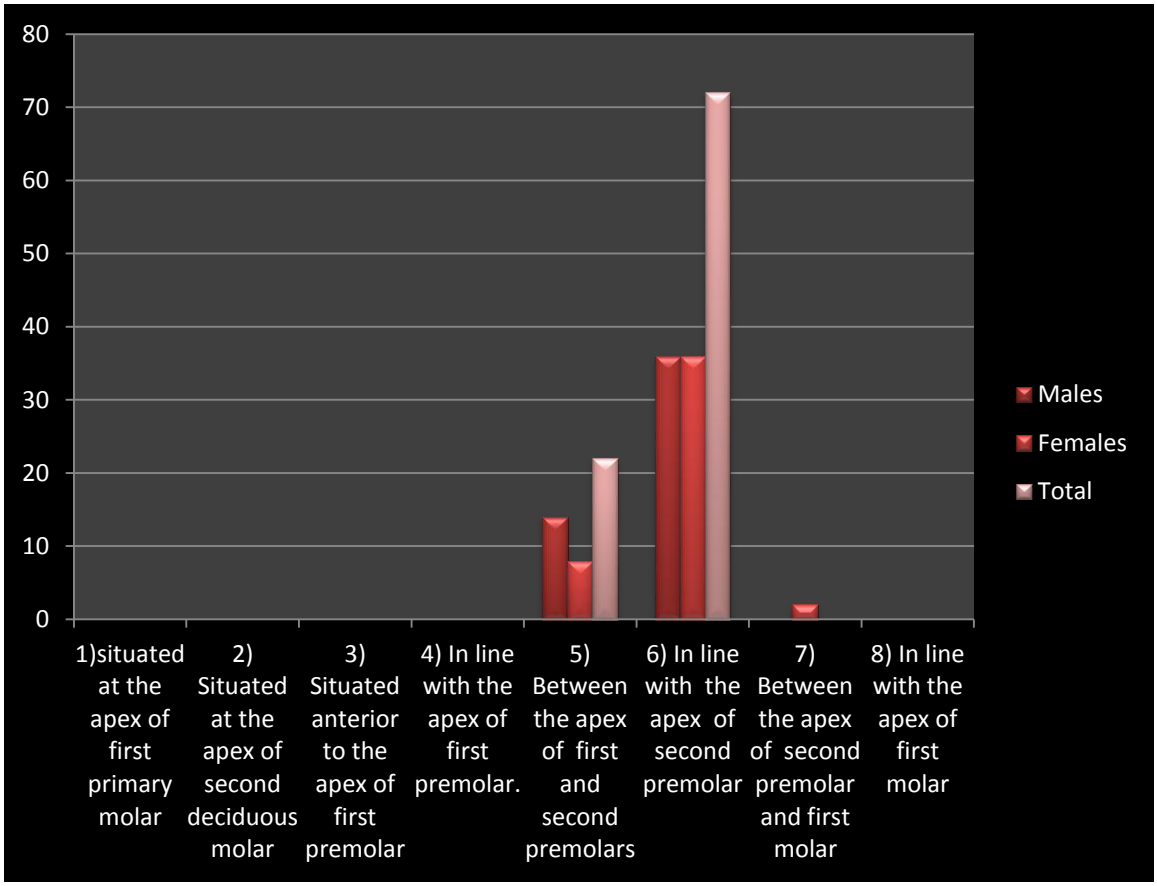
S.No	Size of The Foramen	Sample Size (n)	Mean size in cm		p-Value ANOVA
			Male	Female	
1.	Right	250	0.248	0.232	0.00*
2.	Left	250	0.252	0.238	0.00*
3.	Mean Size	500	0.25	0.235	

Anova
*** (Highly Significant)**

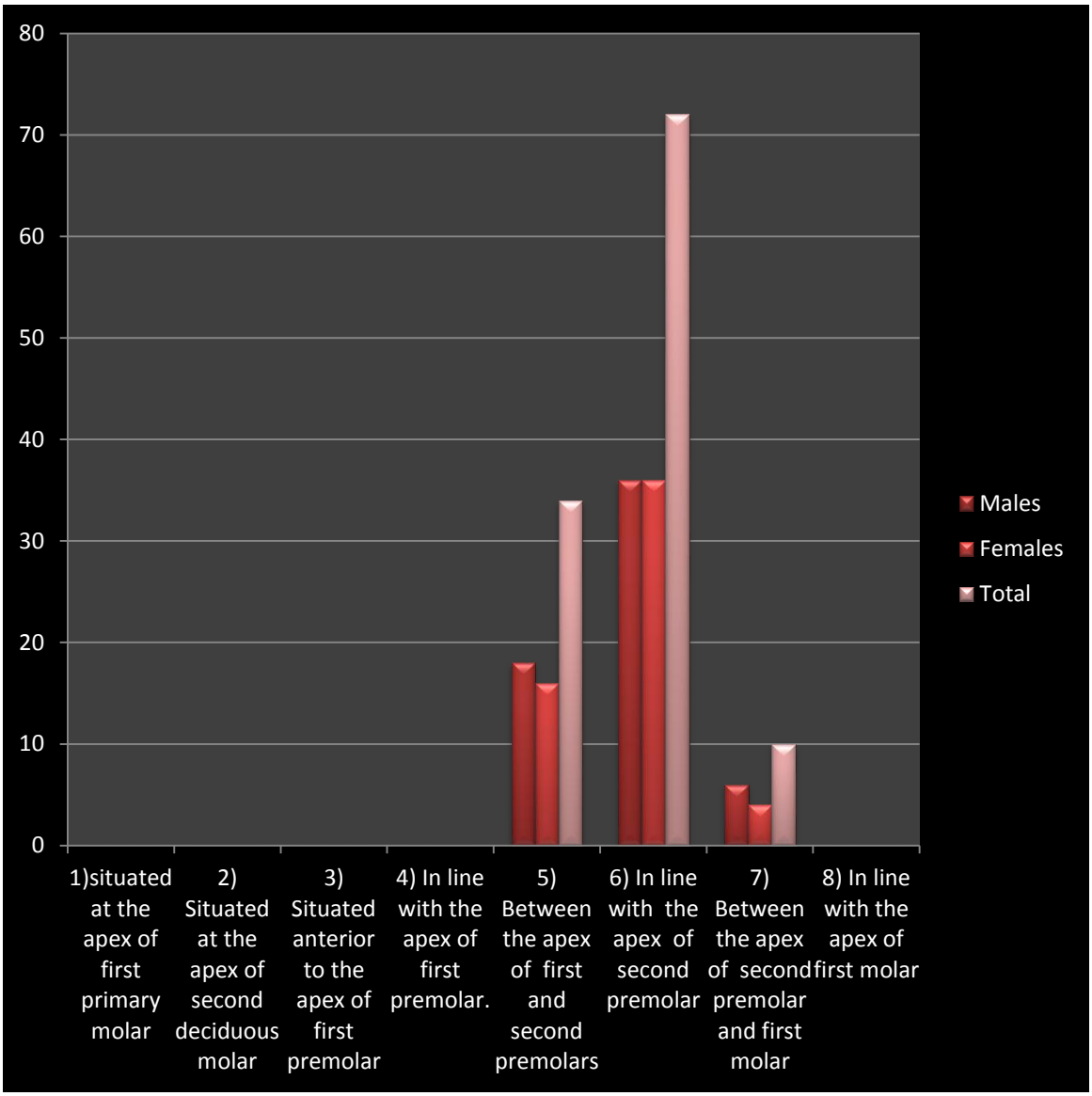
Graph 1.Distribution of presence of mental foramen in the right side of mandible across gender in Group 1



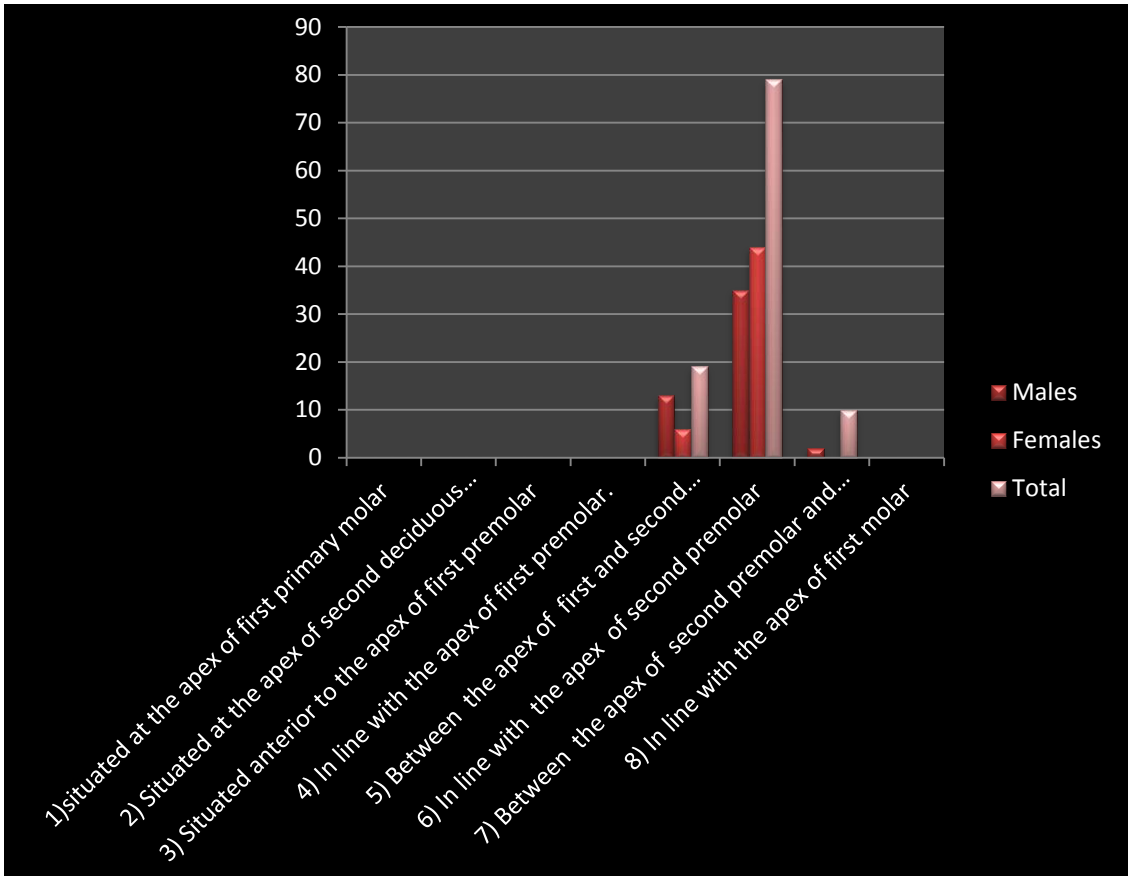
Graph 2: Distribution of presence of mental foramen in the right side of mandible across gender in Group 2



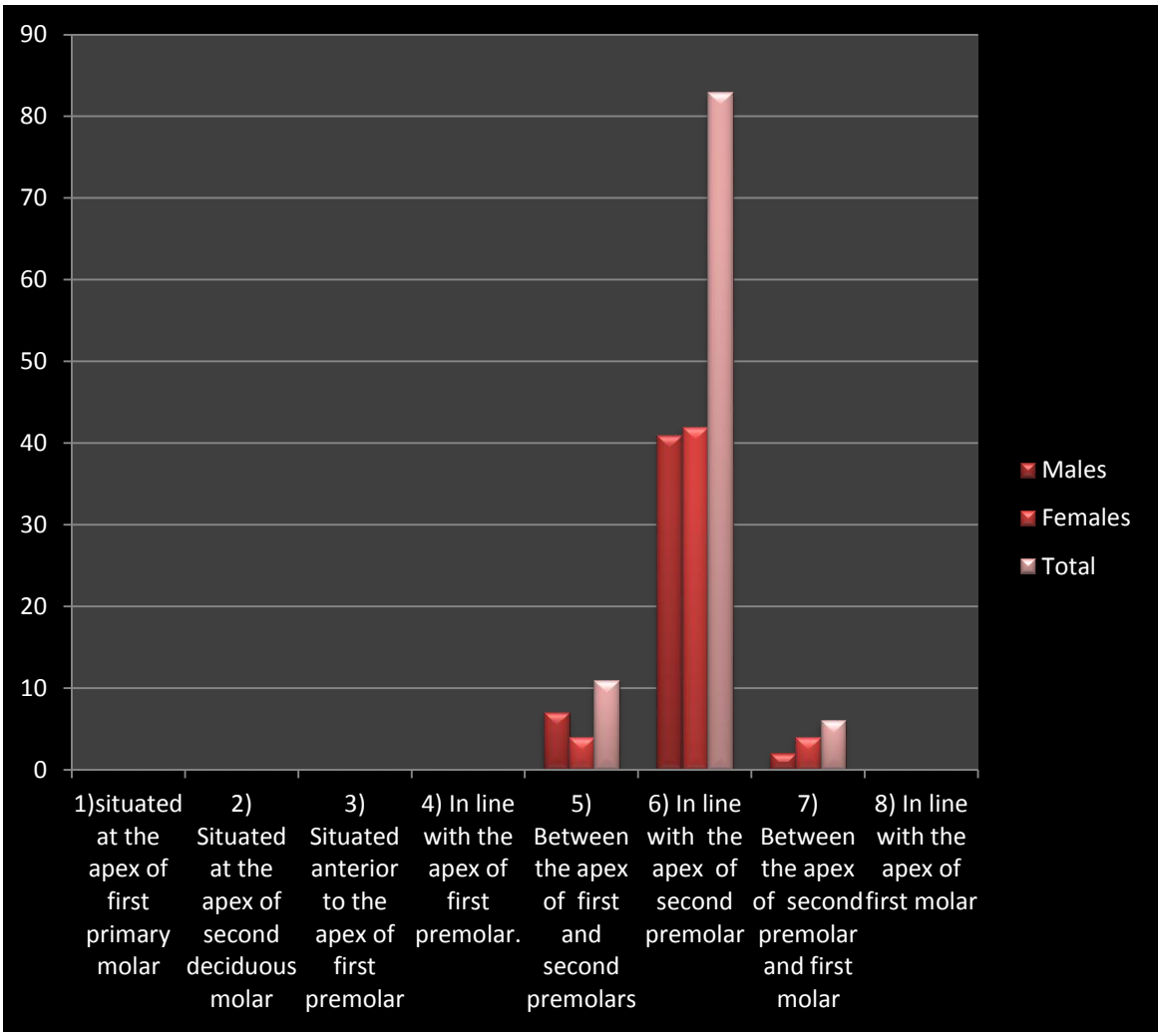
Graph 3: Distribution of presence of mental foramen in the right side of mandible across gender in Group 3



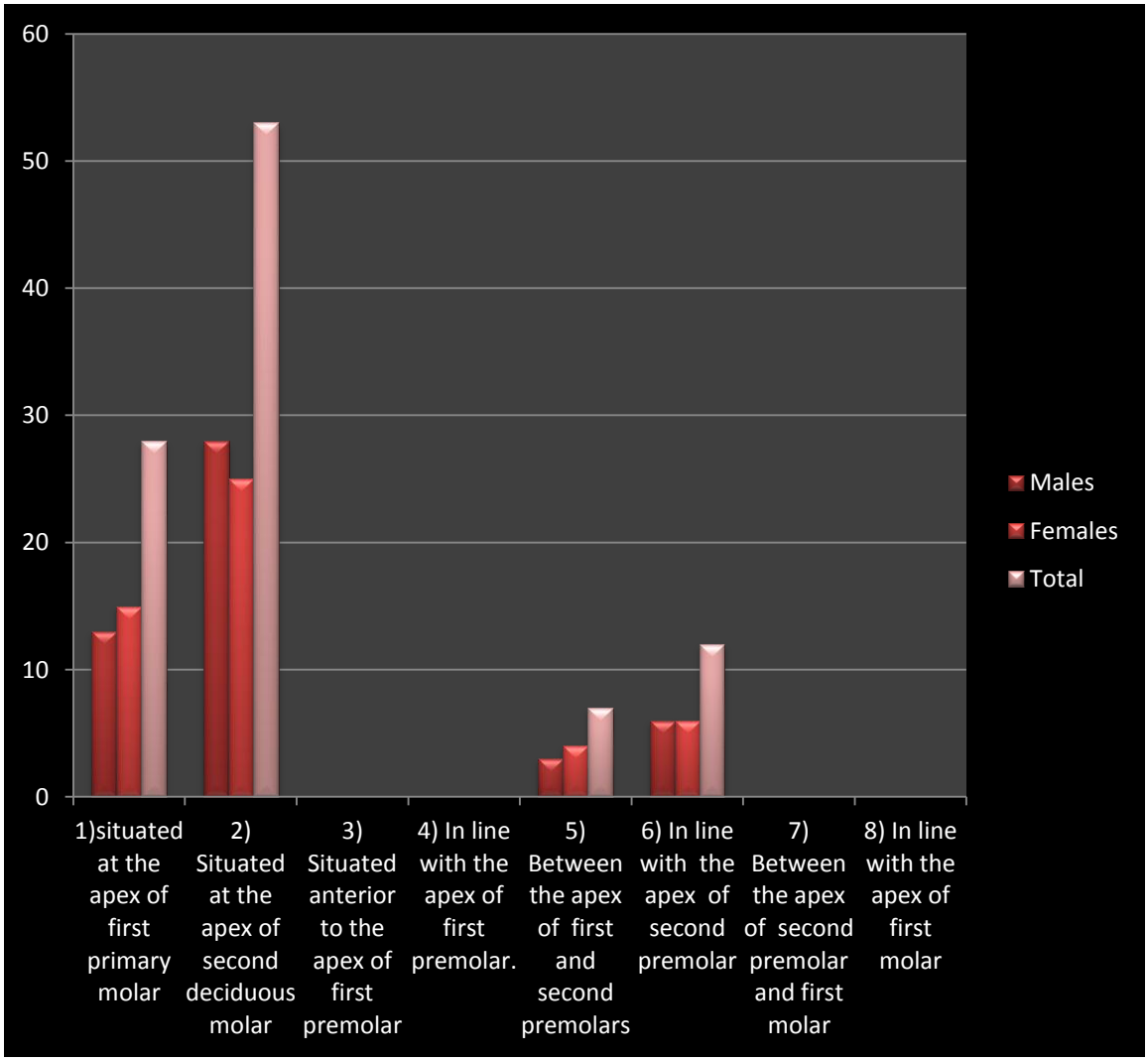
Graph 4 :Distribution of presence of mental foramen in the right side of mandible across gender in Group 4



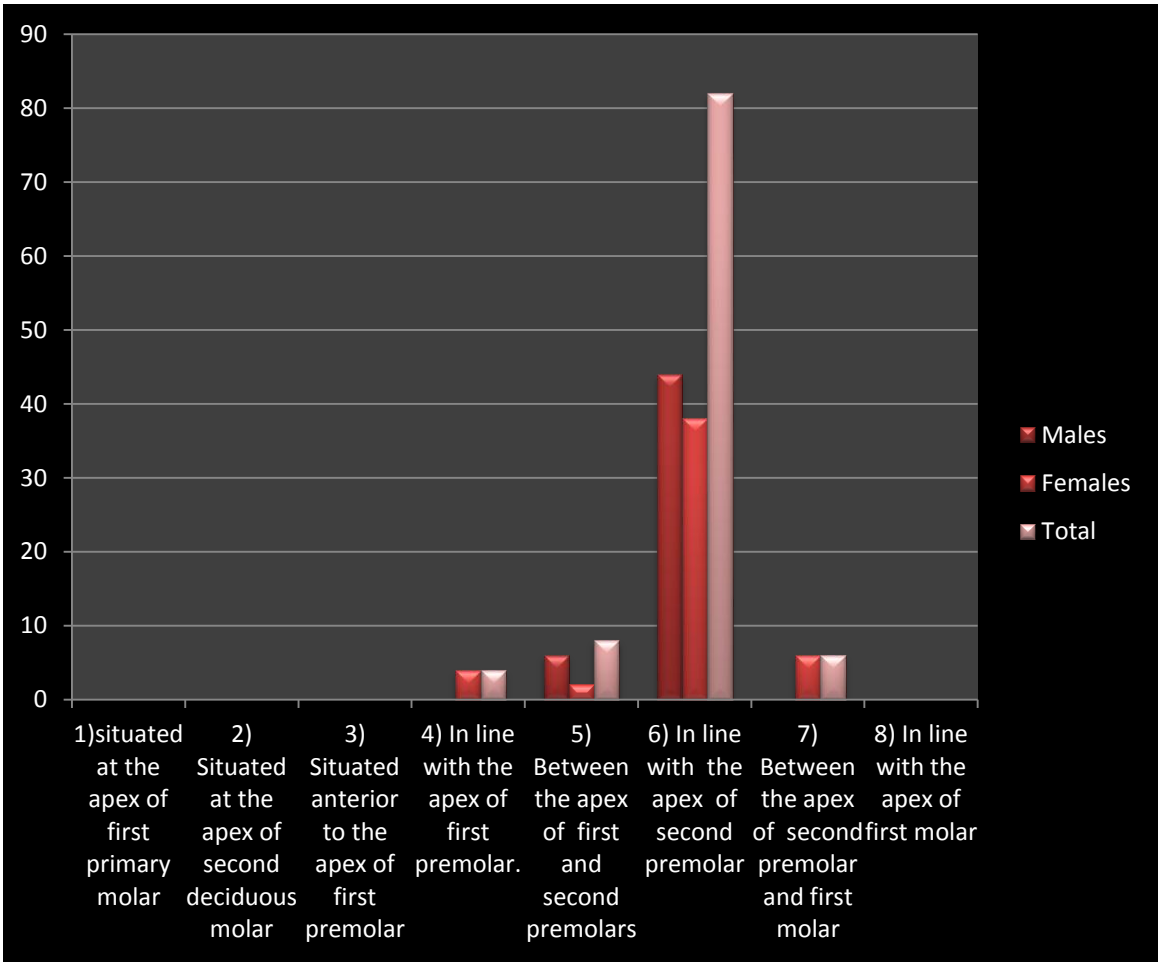
Graph 5 :Distribution of presence of mental foramen in the right side of mandible across gender in Group 5



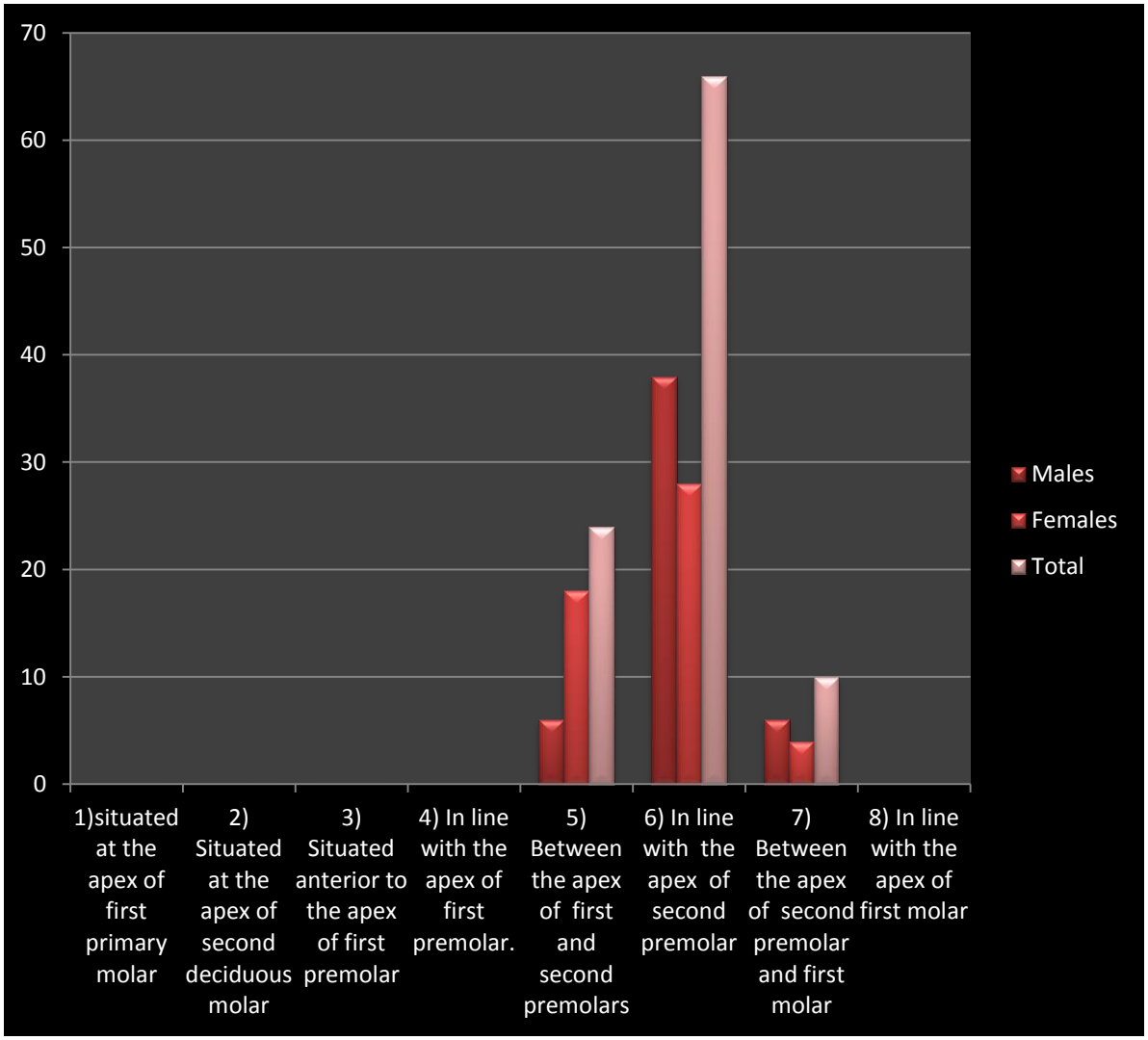
Graph 6: Distribution of presence of mental foramen in the Left side of mandible across gender and age Group 1



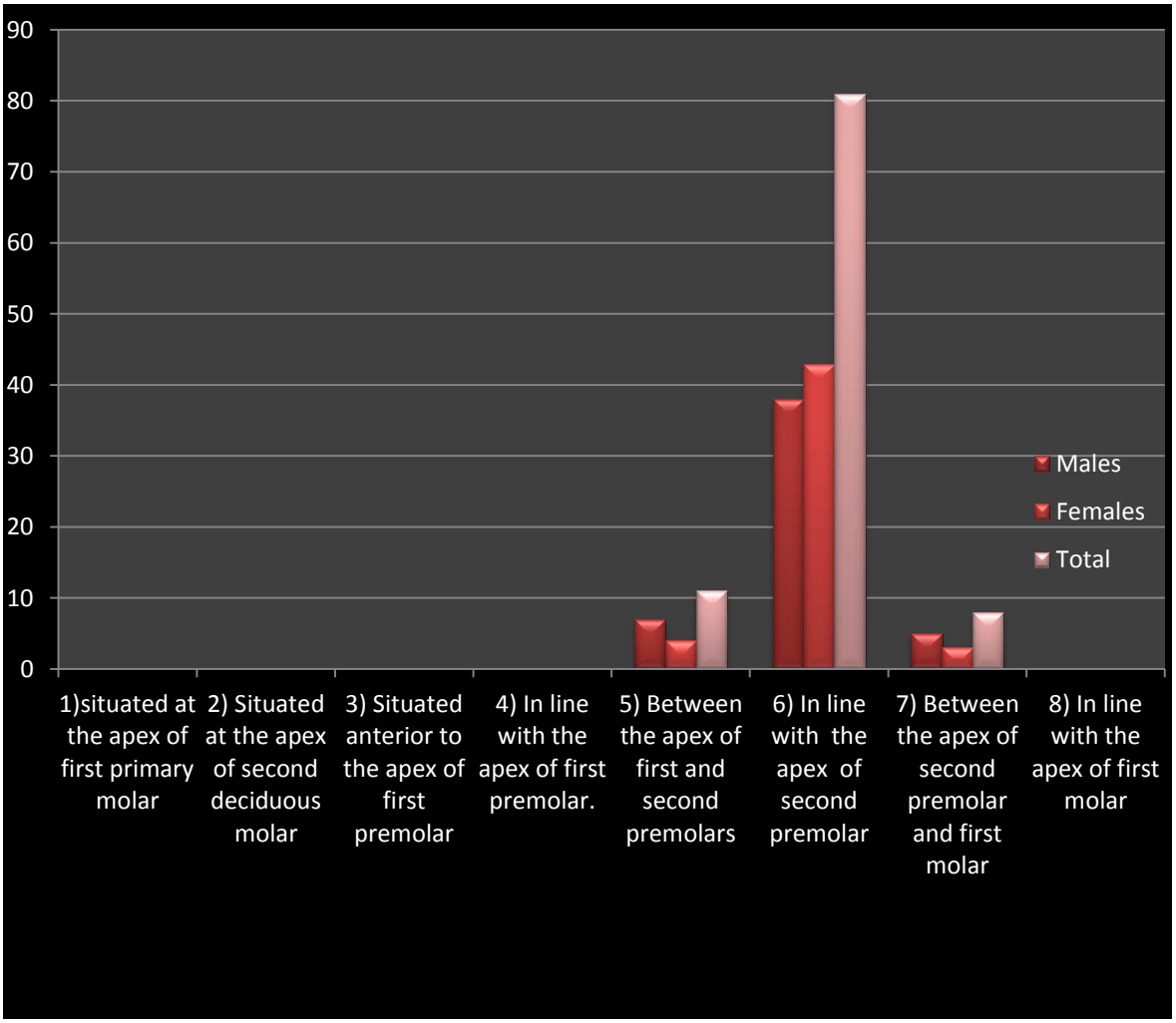
Graph 7: Distribution of presence of mental foramen in the Left side of mandible across gender and age Group 2



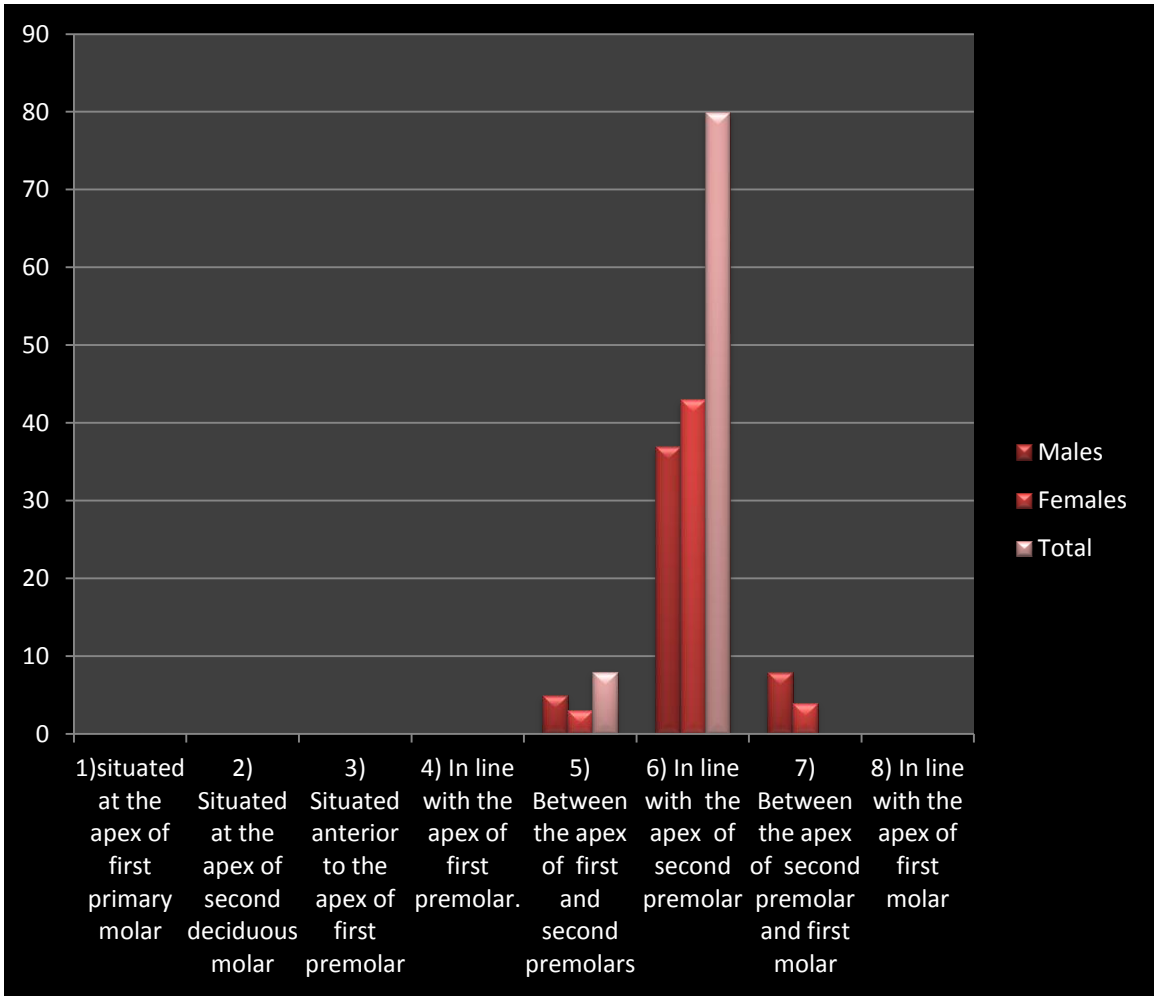
Graph 8 :Distribution of presence of mental foramen in the Left side of mandible across gender and age group 3



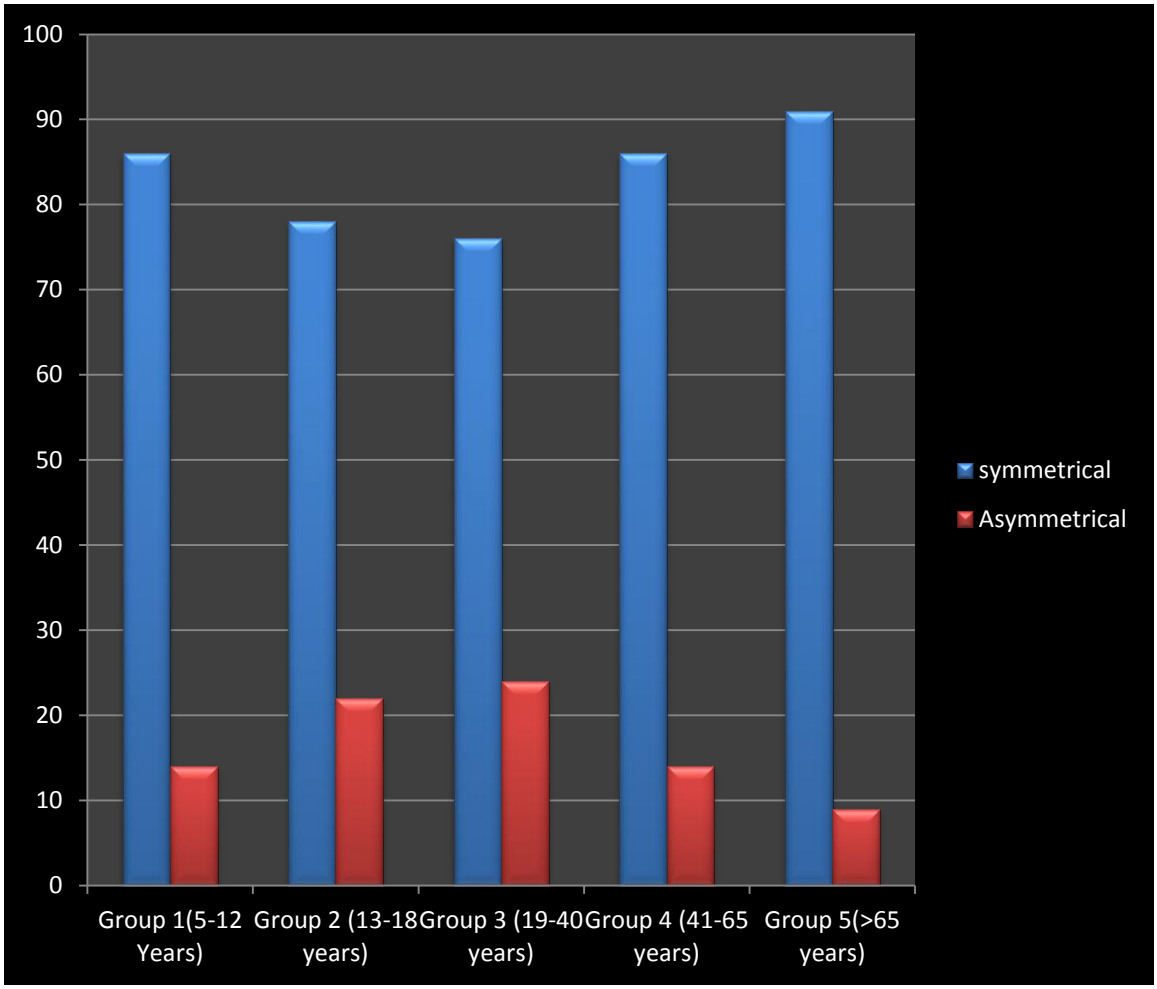
Graph 9: Distribution of presence of mental foramen in the Left side of mandible across gender and age group 4



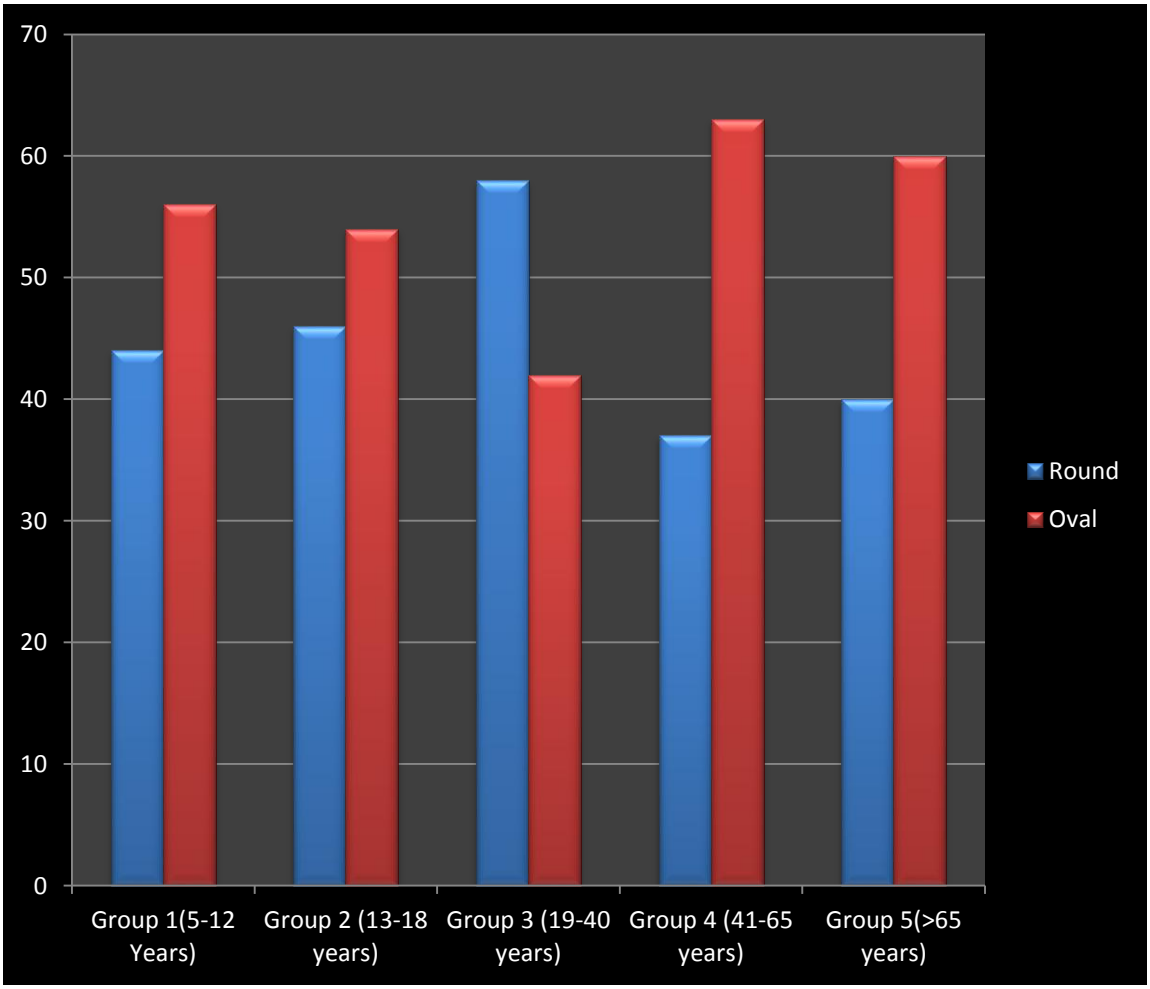
Graph 10 :Distribution of presence of mental foramen in the Left side of mandible across gender and age group 5



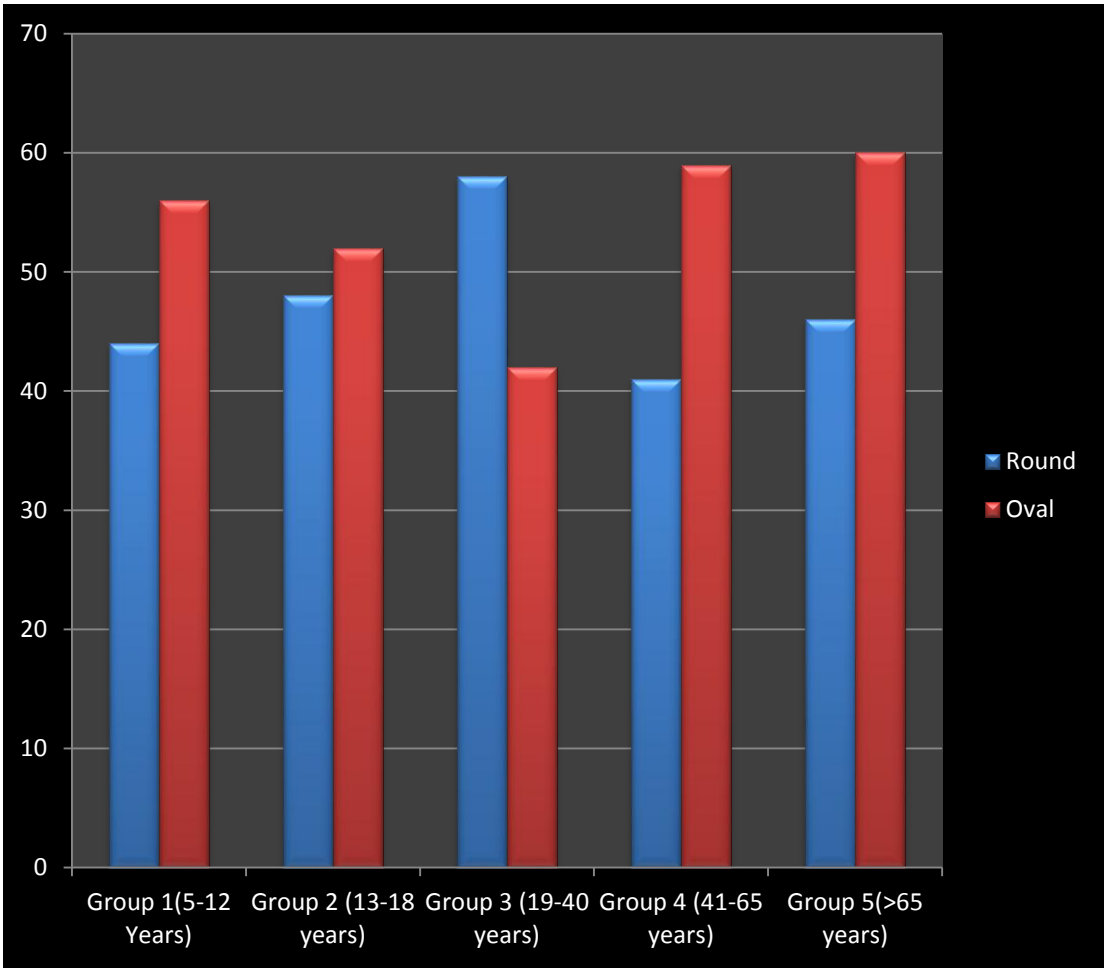
Graph 11: Distribution of symmetry of mental foramen of the Left side as compared with the right side across age group



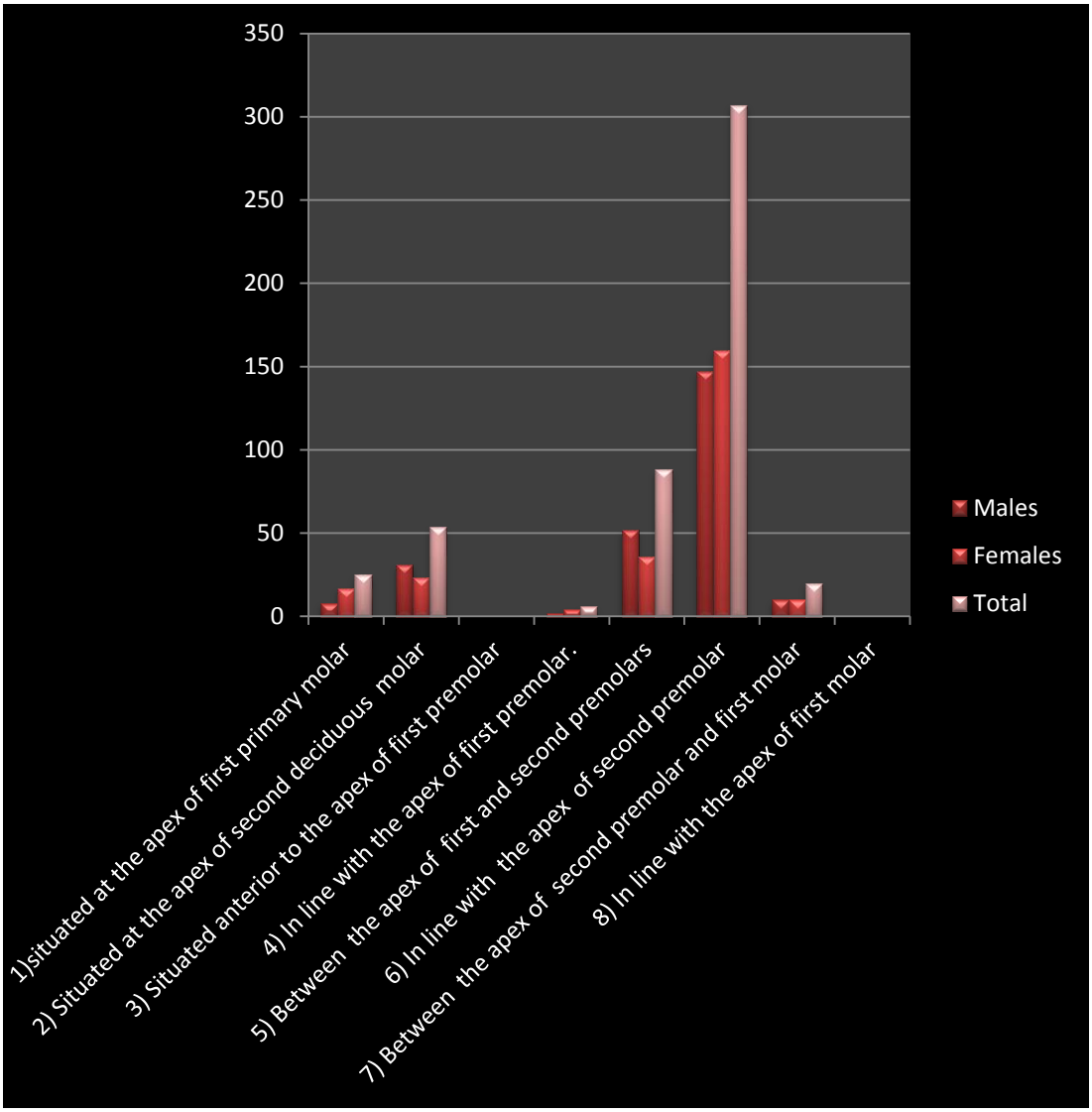
Graph 12: Distribution of shape of mental foramen on right side of mandible and age group



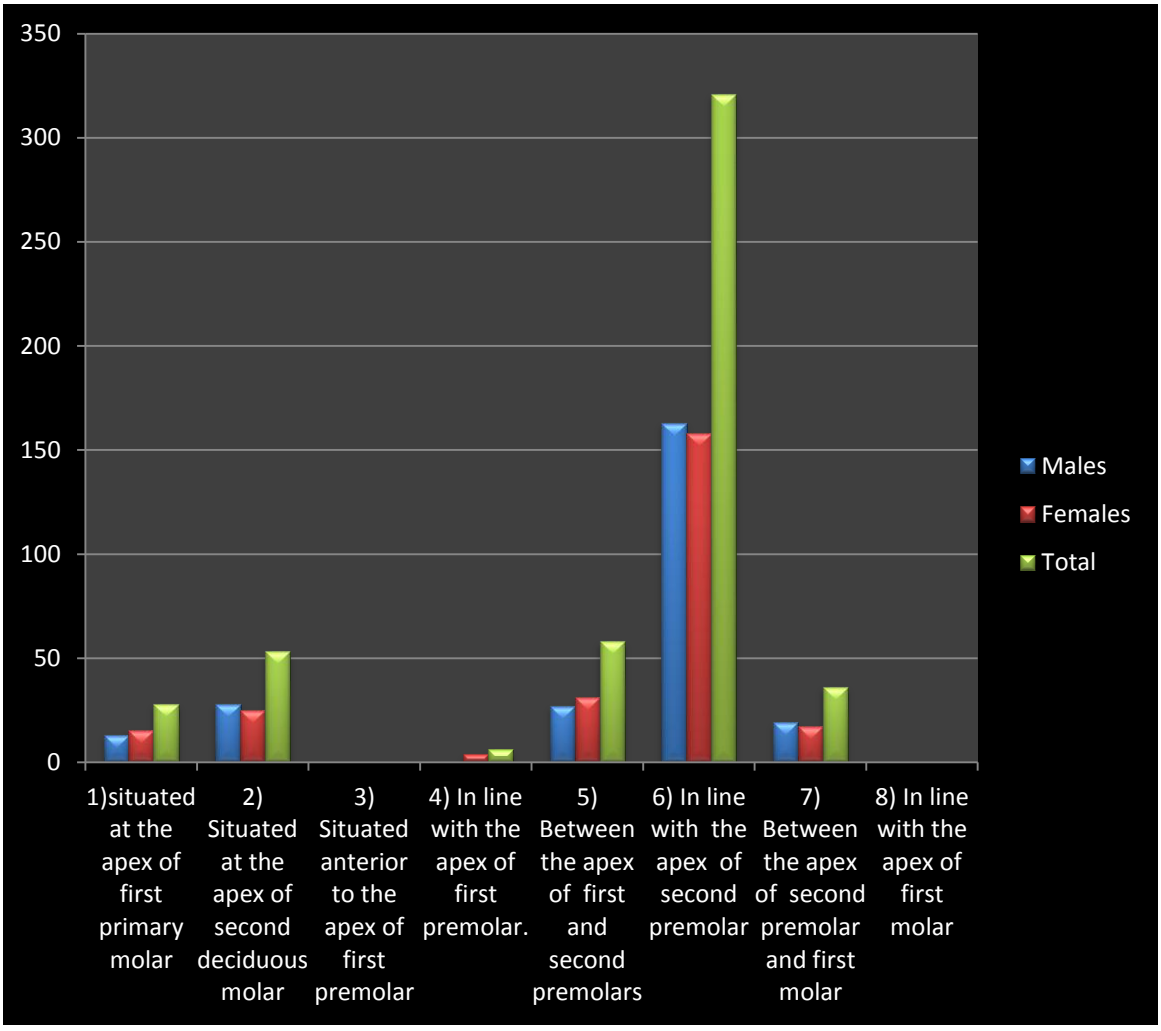
Graph 13: Distribution of shape of mental foramen on left side of mandible and age group



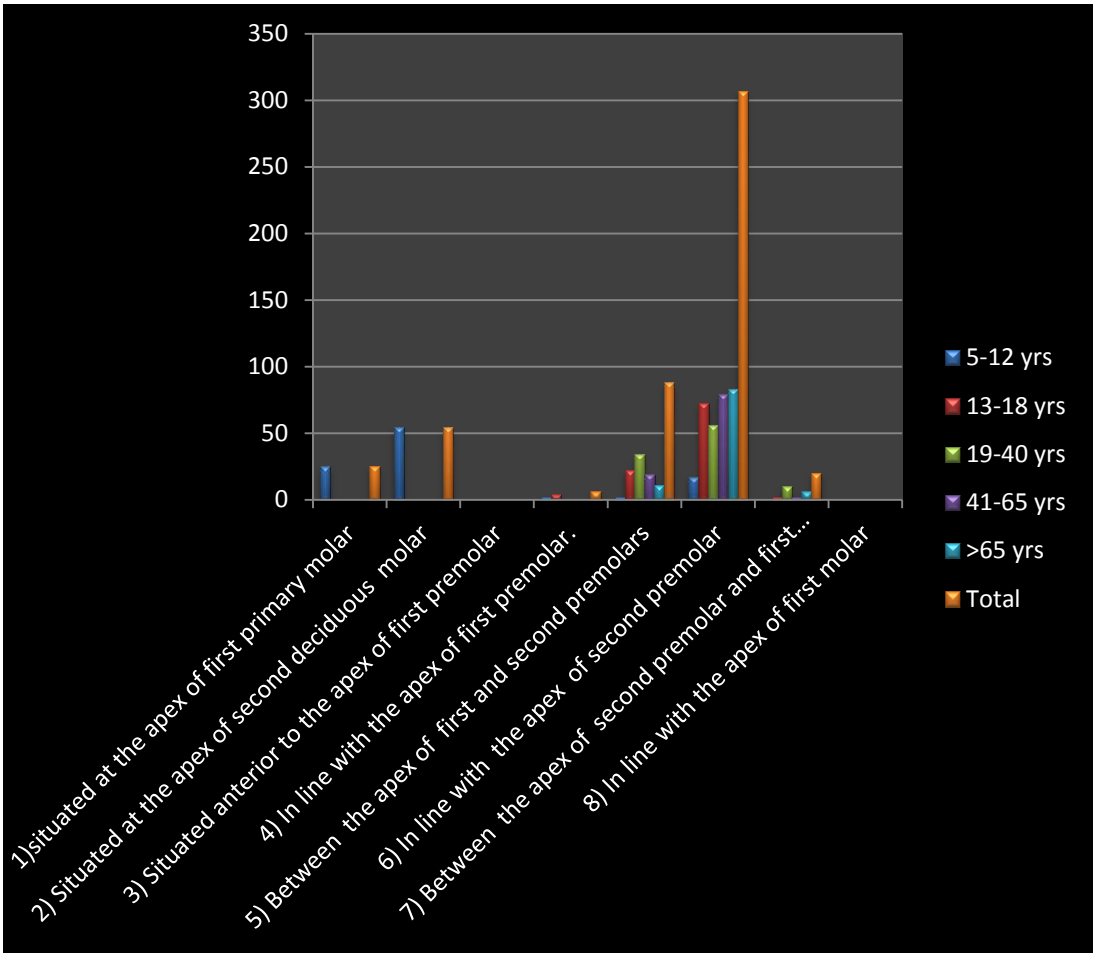
Graph 14: Distribution of presence of mental foramen on right side of with respect to anatomical location across gender



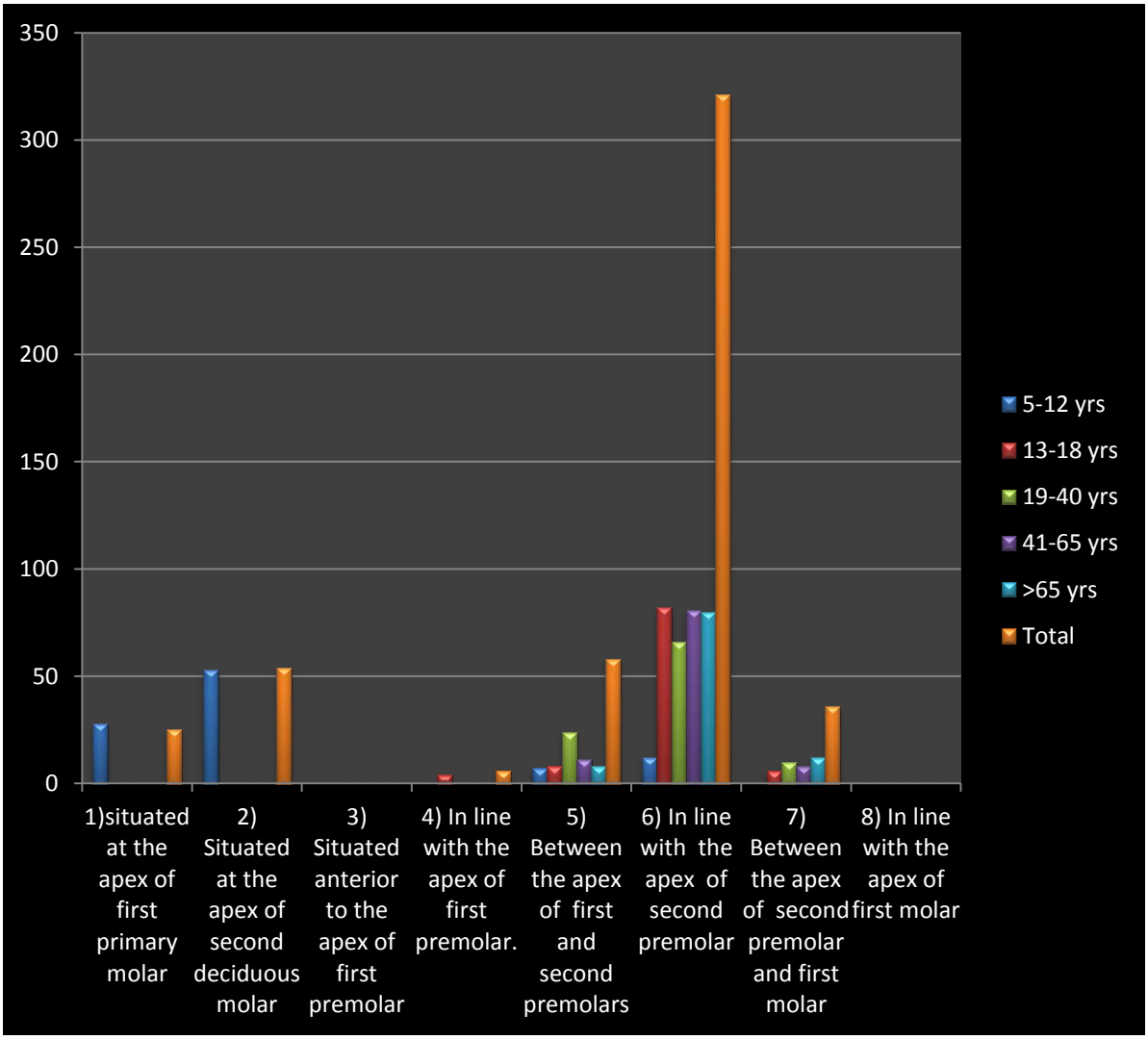
Graph 15: Distribution of presence of mental foramen on Left of mandible with respect to anatomical location across gender



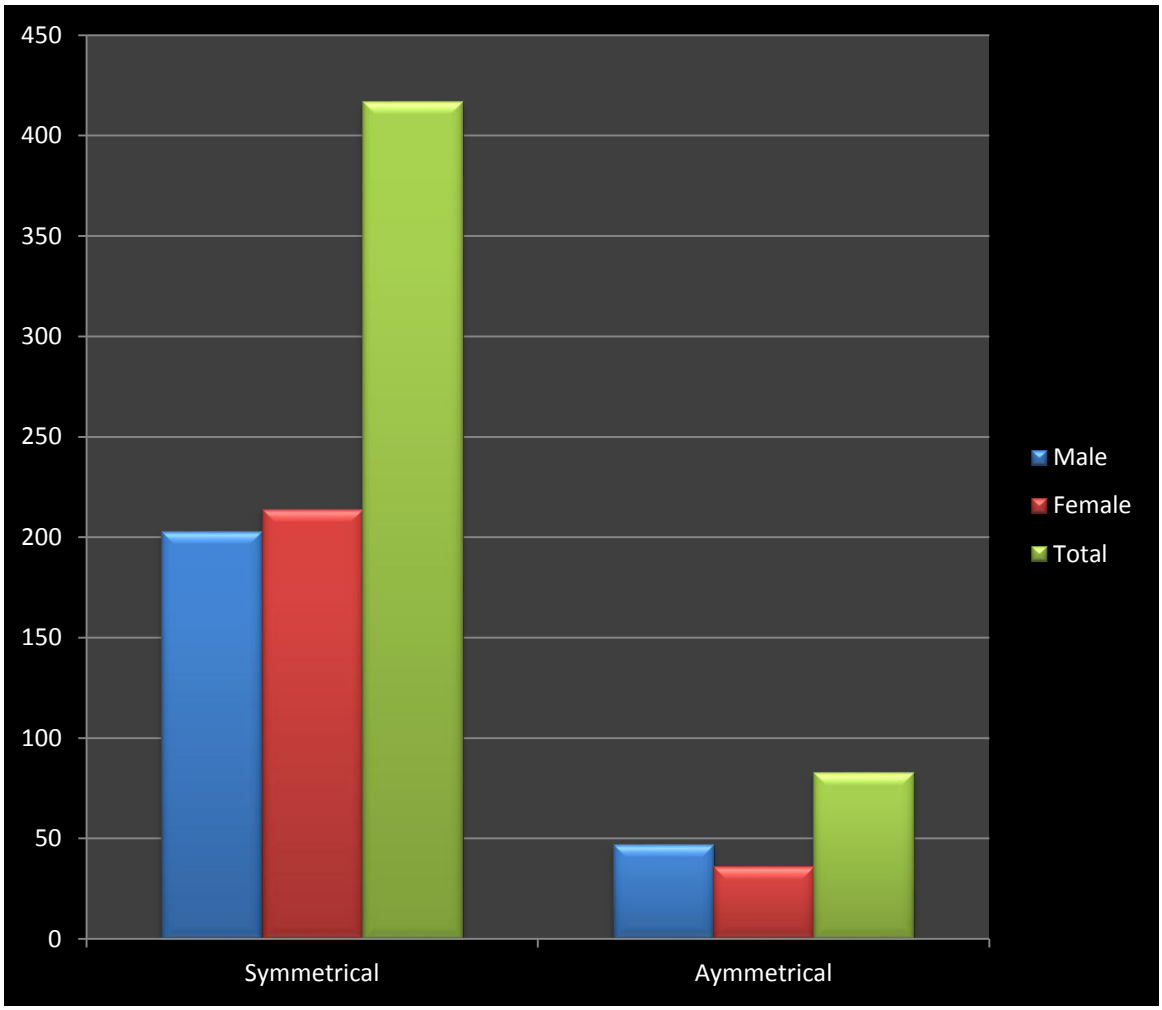
Graph 16 :Distribution of presence of mental foramen on right side of mandible with respect to anatomical location across age group



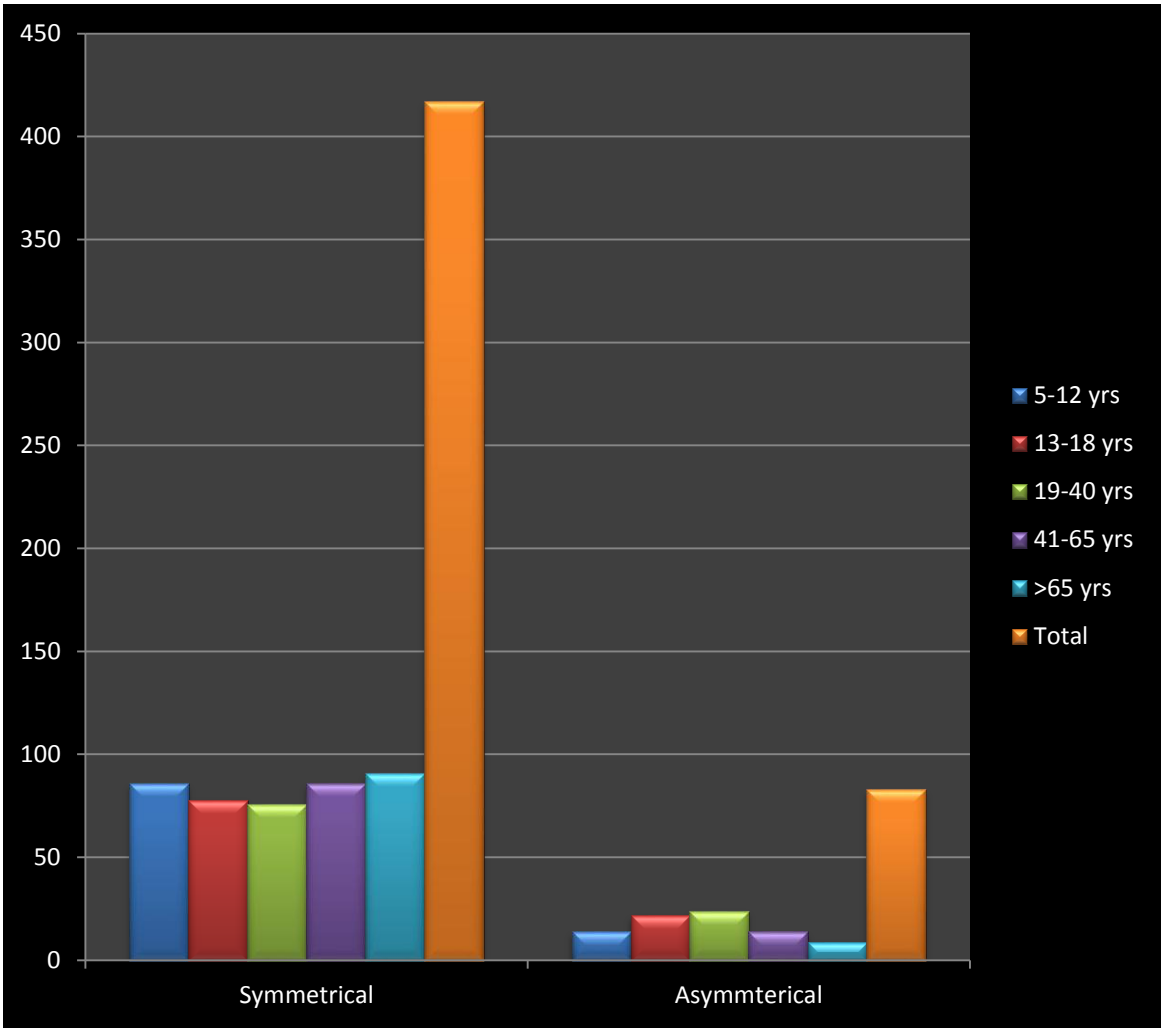
Graph 17: Distribution of presence of mental foramen on left side of mandible with respect to anatomical location across age group



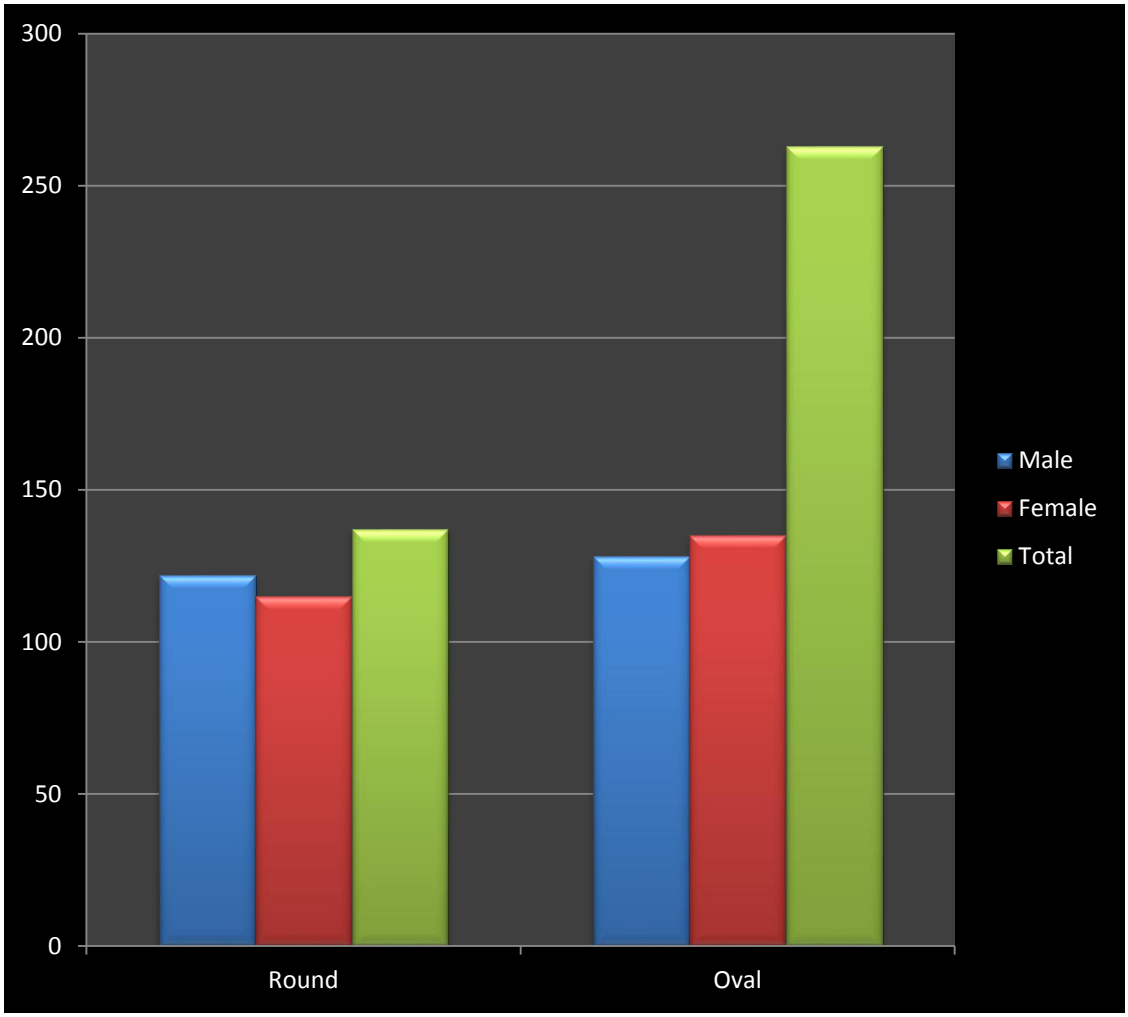
Graph 18 :Distribution of the symmetrical and asymmetrical Mental foramen of left side as compared with right side across gender



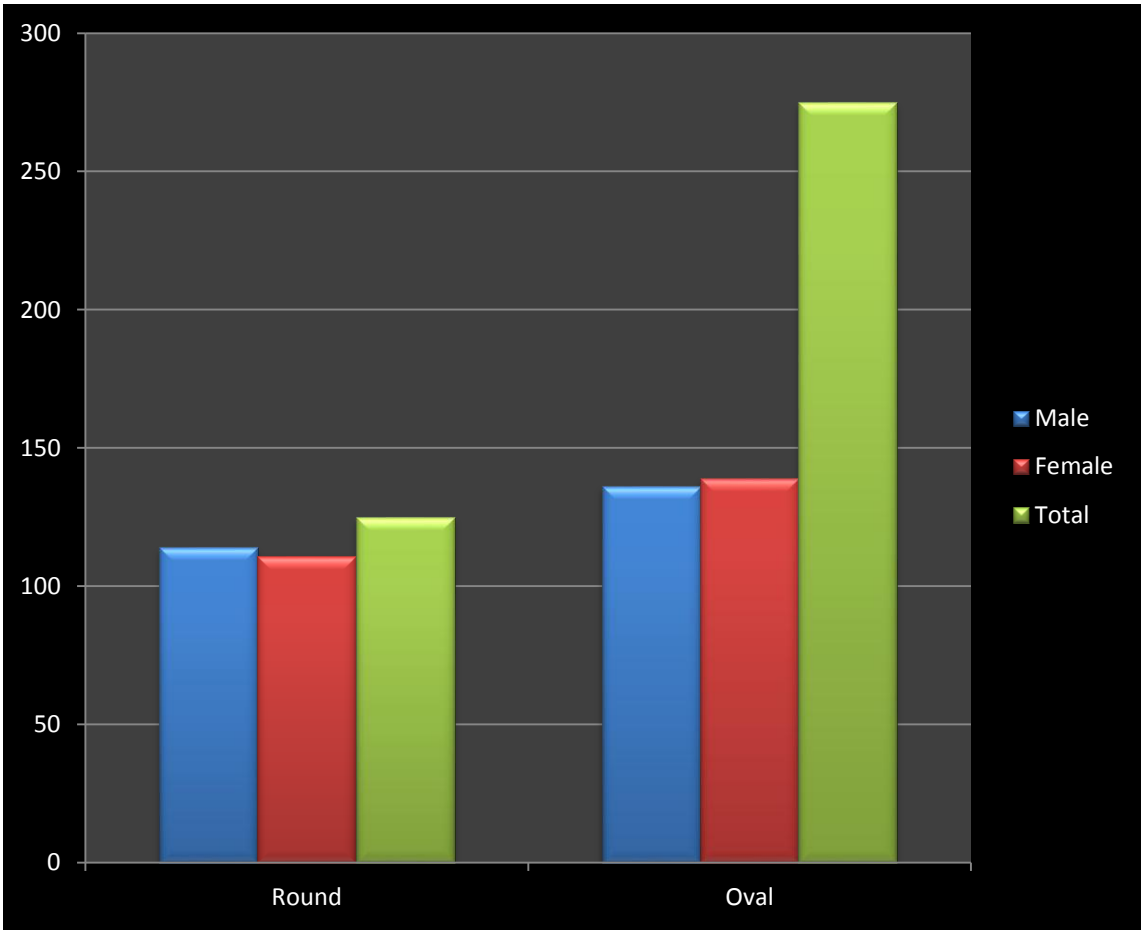
Graph 19:Distribution of the symmetrical and asymmetrical Mental foramen of left side as compared with right side across age group



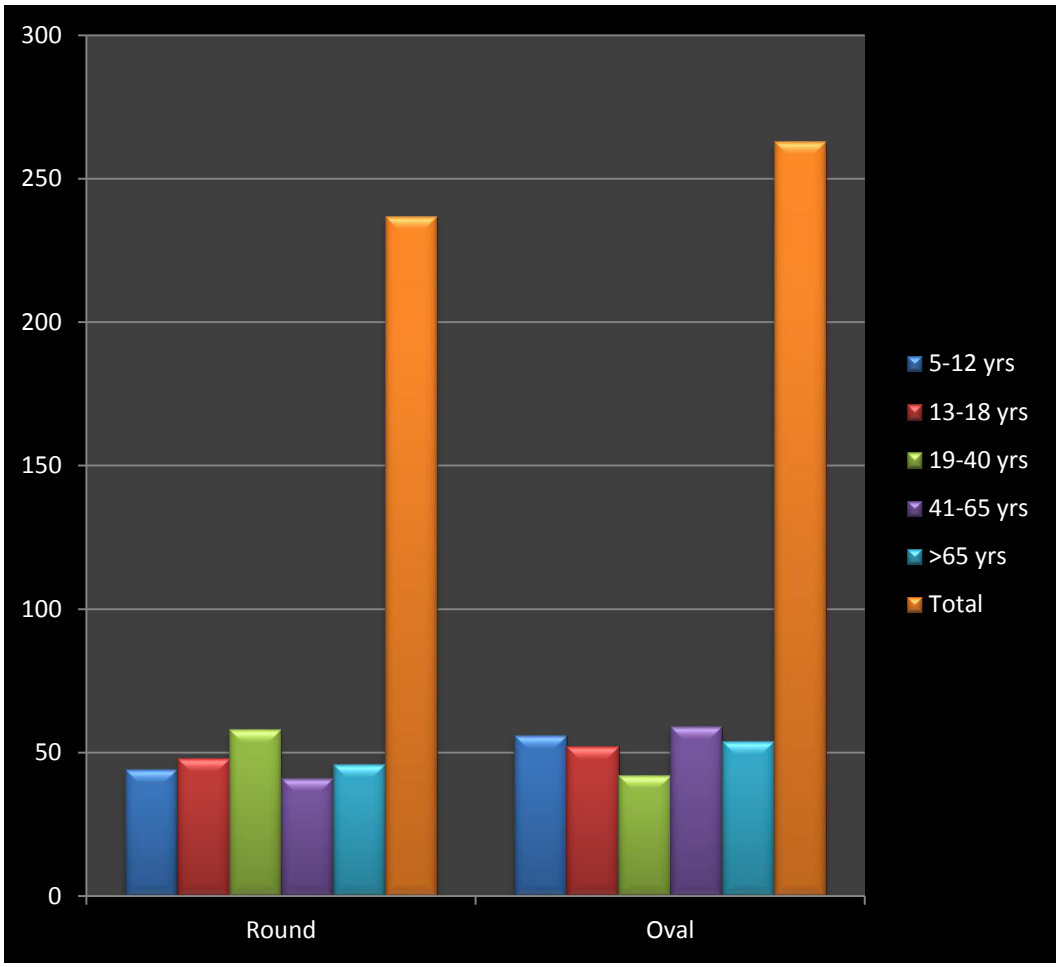
Graph 20: Distribution of the shape of Mental Foramen on the right side of the mandible across gender



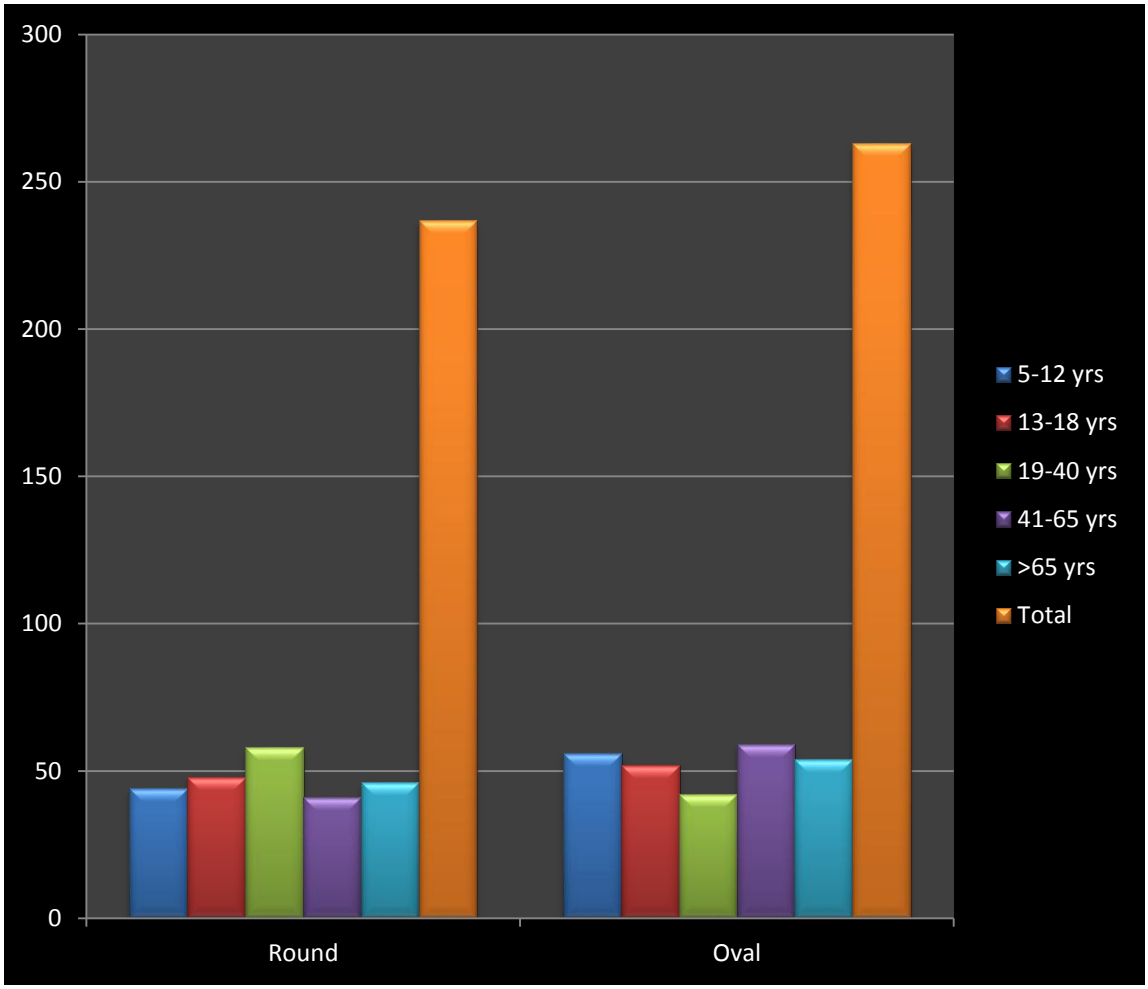
Graph 21: Distribution of the shape of Mental Foramen on the left side of the mandible across gender



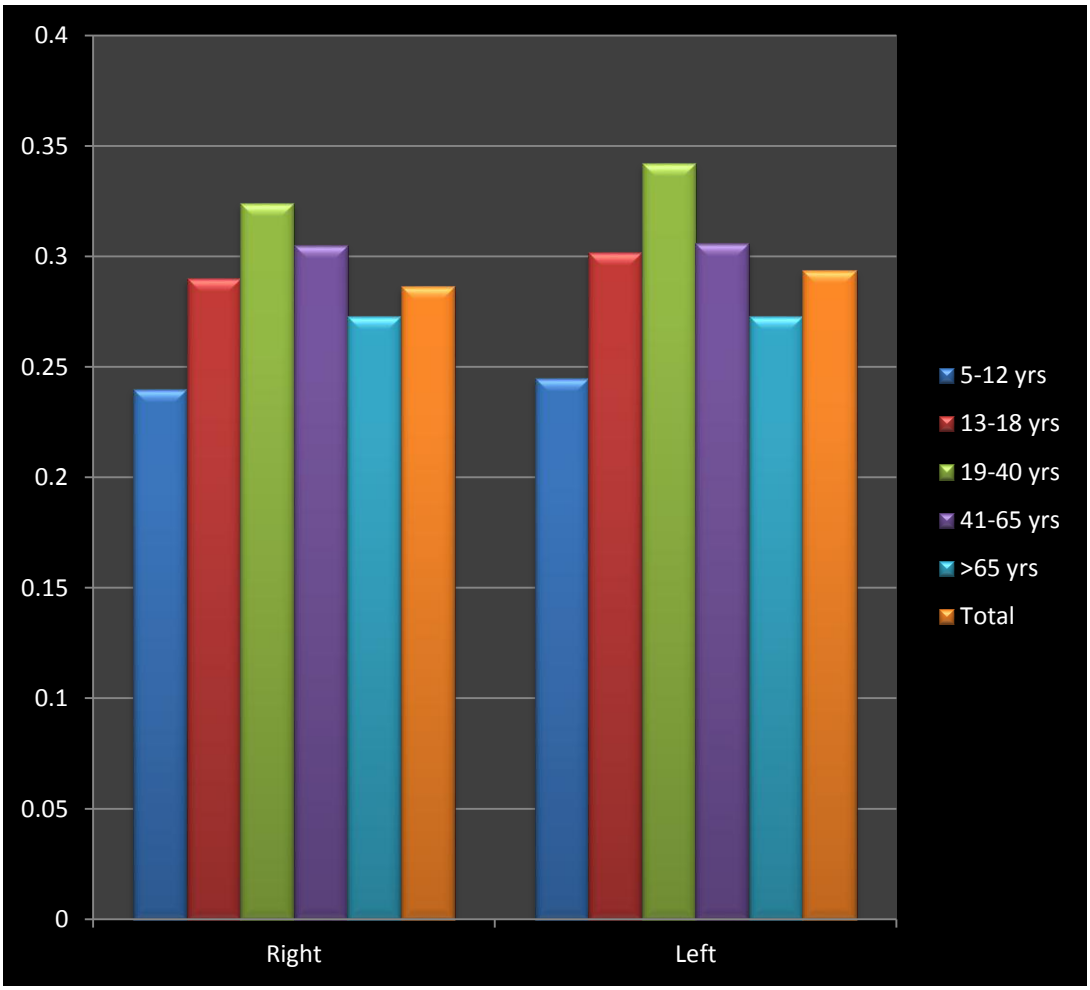
Graph 22: Distribution of the shape of Mental Foramen on the right side of the mandible across age groups



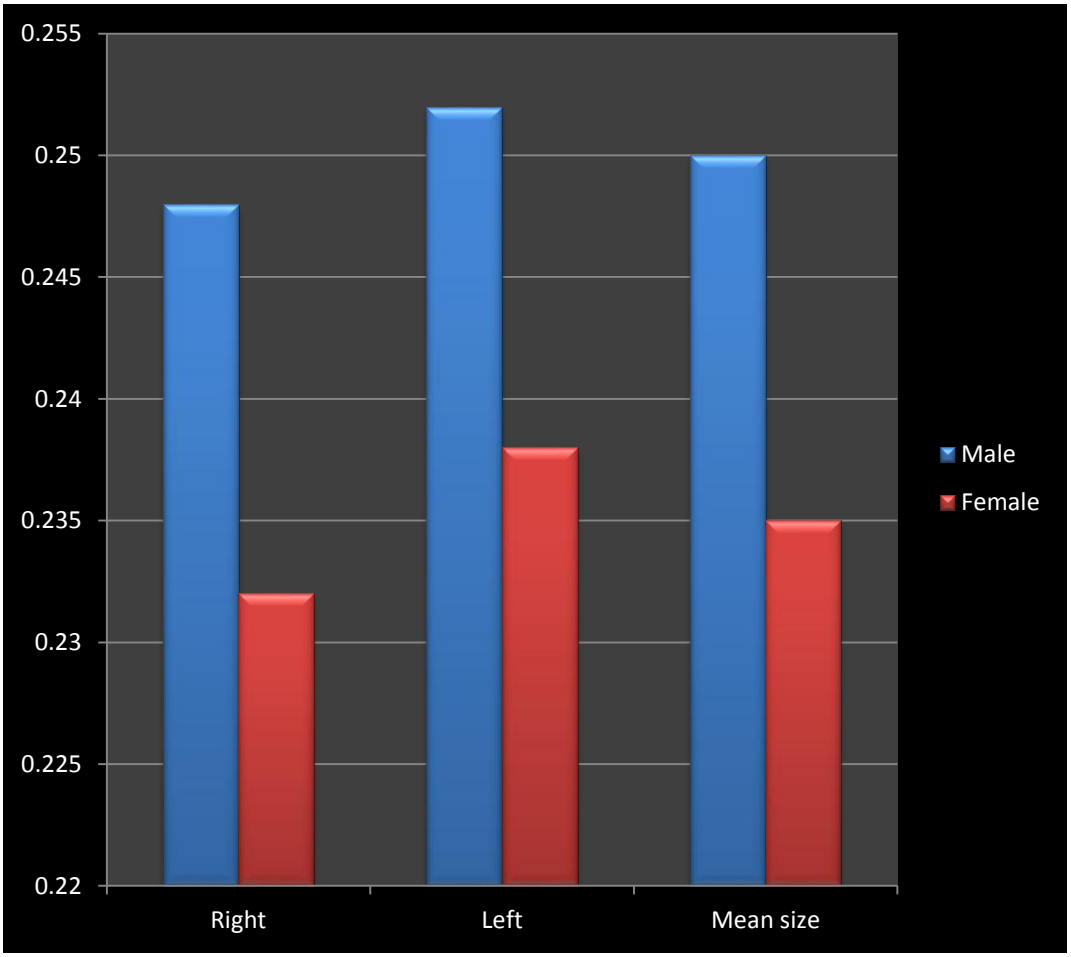
Graph 23: Distribution of the shape of Mental Foramen on the Left side of the mandible across age groups



Graph 24: Distribution of the Size of Mental Foramen across age groups



Graph 25 : Distribution of the Size of Mental Foramen on the left side of the mandible across gender



The size, position and symmetry of the mental foramen presents with many variations as influenced by age, sex, race and hence it is important to study these variations in mental foramen so as to apply it in surgical and anesthetic interventions. The accurate identification of the mental foramen is important for both diagnostic and clinical procedures. The radiographic appearance of the mental foramen may result in a misdiagnosis of a radiolucent lesion in the apical area of mandibular premolar teeth. Clinically, the mental bundle could be injured during surgical procedures like periapical surgeries, implant placements, orthognathic surgeries resulting in paraesthesia or anesthesia. There are no absolute anatomical landmarks for reference and the foramen cannot be clinically visualized or palpated. As a result, the reported anatomical position of the mental foramen has been variable[1]. Studying the position and its morphological variations of MF is very important because it will be helpful to localize the important maxillofacial neurovascular bundle passing through the mental foramen [2]

The Present study is a cross-sectional prevalence study of a hospital based population which was conducted in Department of Oral Medicine and Radiology, Ragas Dental College and Hospital, Chennai. The study was conducted between January 2009 and March 2011. It was designed to evaluate and locate the position, symmetry, shape, size and abnormalities of the mental foramen using orthopantomograms on a hospital based population. The results obtained are discussed here with respect to the previous studies and probable differences and similarities are discussed

Methodology of Assessment:

The assessment of the Mental Foramen was done using the orthopantomogram in our study. According to **Langlais et al**[4],in the article of **Sidney Ricardodotto et al**[4] panoramic radiographs are simple to be acquired and require a minimum amount of time for its execution. Furthermore, both maxilla and mandible are projected at the same view with a relatively low radiation dose. Another advantage of this type of projection is the minimum cost when compared to CT scans. However, its final image is often magnified, with definition loss and anatomic structures superimposition. The diagnostic value of those images is less sensitive in comparison to CT and intraoral images

Our study evaluated the mental foramen by the use of orthopantomogram and this is in accordance with **Kahraman Gungor et al**[16] who also investigated the position of the mental foramen in the panoramic radiographs from a selected Turkish population. Similarly, **NM Al Jasser et al**[7] determined the most common position of the mental foramen from panoramic radiographs in a selected Saudi population

In the article of **Evelise Ono et al**[17]**,** it is stated that **Lindh and Peterson** compared panoramic and conventional tomographic images as tools to visualize the mandibular canal. These authors stated that the tomography gave a significantly clearer image of the canal at and 1cm posterior to the mental foramen, while no differences were found between the methods 2cm posterior to the mental foramen.

Nazar Al Talabani et al [21] developed and characterized a computer-based application to locate the position of the mental foramen (MF) on **orthopantomograms** of both dentulous and edentulous patients. Panoramic radiographs were analyzed using the computer programs Photoshop and AutoCAD to locate the MF in the horizontal and vertical planes in 110 dentulous patients and in the superior/inferior planes of 50 completely edentulous patients.

Ongkosuwito et al [25] investigated the reliability of length measurements of the mandible by comparing orthopantomograms with lateral cephalograms. Orthopantomograms and lateral cephalograms were taken of 20 human dry skulls and concluded that an Orthopantomograms is as reliable as a lateral cephalogram for linear measurements of the mandible (condylion-gonion, gonion-menton, and condylion-menton)

Bou Serhal et al [6] assessed the accuracy of panoramic radiography and spiral or computed tomography for the localisation of the mental foramen. Panoramic radiography showed more deviation from the perioperative measurements than either spiral or computed tomography The difference was significant $P<0.05$. In general, distances were overestimated on the panoramic radiographs.

Other studies have assessed the mental foramen on dry skulls. **W. Apinhasmit et al** [12] studied Sixty-nine adult mandibles 45 male, 24 female of Thai dry skulls which were assessed to determine the size, the orientation and the location of the mental foramen related to gender and side. **Maise**

Mendonça Amorim[13] determined the position of mental foramen (MF) in a sample of one hundred seventy Brazilian adult dry mandible, being 79 edentulous and 91 dentate.**LBL Prabodha et al** [3]carried out a study in the Department of Anatomy Faculty of Medicine, University of Ruhuna. 24 hemimandibles were examined and out of which there were 15 Male and 09 Female subjects.

Position of the Mental Foramen

The present study shows the anatomical location of mental foramen was found in line with the apex of the second premolar in 307(61.4%) in the right side of the mandible and Anatomical location of mental foramen in the left side of the mandible was found in line with the apex of the second premolar in 321(64.2%)and this is in accordance with Yesilyurt et al[8], Abu UbaidaSiddiqui et al [10],Rajani Singh et al [1],MaiseMendonça Amorim[13,] Flora M Fabian[15]and Apinhasmit *et al*[12]

The racial variations in the position of the mental foramen are discussed and compared with our hospital based population.**Yesilyurt et al** [8] in their study have quoted that the most common positions for the MF were below the second premolar tooth in Indian, Chinese, Kenyan Africans, Nigerians and Mongoloid populations**. Rajani Singh et al** [1]conducted a study using dried adult Indian human mandibles of both sexes. Mental foramen was located below the apex of second premolar in 68.8 percent mandibles while it is 17.8 percent between first and second premolars and in 11.5 percent, it is between second premolar and first molar. **Abu Ubaida**

Siddiqui et al [10] assessed various parameters pertaining to the morphology and morphometry of the mental foramen in 93 dry Indian human mandibles and concluded that the most common position of the MF as related to the lower set of teeth was in line with the second premolar

Flora M Fabian[15] documented the location, adult black Tanzanian population. A hundred mandibles were available for study showed that most common position of the mental foramen was located below the apex of the second premolar (45%)

However, there are some variations found in the position of the mental foramen and this was documented by the following studies.

Haghanifar et al[11] in their radiological study of the MF, reported that the most common position of the MF was between the two premolars it being 47.2%. (71.5% cases). In the article of **Abu Ubaida Siddiqui et al** [10]**,** it is stated that **Aktekin*et al*** stated that the mentonian foramen normally is located under and between the apexes of the two pre molars.

In the article of **W. Apinhasmit** [12]**,** it is stated that **Fishel *et al*** did a radiological study of the mentonian foramen, where they examined one thousand full mouth intra-oral x-rays and after the analysis, on the horizontal plane, in 70% of the cases, the mental foramen was located between the two premolars and in 22% of the cases the foramen was located in the apical area of the premolars

Yesilyurt et al [8]in their study have quoted that the Anatomical Location of Mental Foramen is posterior to the second premolar in

Caucasians and Zimbabweans and between the premolars in Negroid, British, Central Anatolian and North American white populations.

In the article of **W. Apinhasmit [12],** it is stated that **Wang *et al*** showed that the location of the mentonian foramen under the apex of the lower first premolar was the most common location (58.98%).

KahramanGungor[16] investigated the most common position of the mental foramen in a selected Turkish population. The most common position of the mental foramen was between the first premolar and the second premolar (71.5%).

Edentulous Mandibles

In our study, the position of the mental foramen in edentulous patients was also evaluated by plotting midline reference plane and comparing the distance of the mental foramen from the midline. This is in accordance with **Ongkosuwito et al [25]** who investigated the reliability of length measurements of the mandible with orthopantomograms of 20 human dry skulls and concluded that An Orthopantomograms is as reliable as a lateral cephalogram for linear measurements of the mandibles. The calculated distance is then transferred to dentulous Orthopantomogram of the same age group and the position of the mental foramen is determined with respect to the long axis of the tooth.

Previous studies by **Maise Mendonça Amorim [13]**determined the position of mental foramen in a sample of one hundred seventy Brazilian

adult dry mandible, being 79 edentulous and 91 dentate mandibles. The distance between the center of mental foramen and the mandibular symphisis that is the midline of the mandible was then measured and compared with the dentulous mandibles to find the relative position of the foramen with respect to the teeth. The study showed, for the Brazilian population, the location in line with the long axis of the second premolar as the most common position of the mental foramen. This was in accordance with our study.

Age Variations of the position of the mental foramen

Anatomical location of mental foramen was found situated at the apex of first deciduous molar in 25(5%) of which all the 25 (5%) of the patients were present in group 1(5-12 years).Anatomical location of mental foramen was found situated at the apex of second deciduous molar in 54(10.8 %) of which all the 54 (10.8%) of the patients were present in group 1(5-12 years).Anatomical location of mental foramen was found in line with the apex of the second premolar in 307(61.4%) of which 17 (3.24%) of the patients were present in group 1(5-12 years), 72(14.4%) were present in group2 (13-18 Years), 56(11.2%) were present in group 3 (19-40 years of age), 79(15.8%) were present in gruop4 (41-65 years of age) and in 83(16.6.%) of the patients in group 5 (> 65 years of age) .On the left side, Anatomical location of mental foramen was found situated at the apex of first deciduous molar in 28(5.6%) of which all the 28 (5.6%) of the patients were present in group 1(5-12 years). Anatomical location of mental foramen

was found situated at the apex of second deciduous molar in 53(10.6 %) of which all the 53 (10.6%) of the patients were present in group 1(5-12 years).Anatomical location of mental foramen was found in line with the apex of the second premolar in 321(64.2%) of which 12 (2.2%) of the patients were present in group 1(5-12 years), 82(16.4%) were present in group2 (13-18 Years), 66(13.2%) were present in group 3 (19-40 years of age), 81(16.2%) were present in group 4 (41-65 years of age) and in 80(16.%) of the patients in group 5 (> 65 years of age) . The distribution of presence of mental foramen on right and left side of mandible in respective anatomical location across age group was highly statistically significant, p-Value<0.000.

Previous studies by **Evelise Ono et al**[17] evaluated the anteroposterior position of the MF, and verified the possible changes on its location on 7 to 12 year-old children. Ninety panoramic radiographs from the Dentomaxillofacial Radiology department at the Dentistry School of São José dos Campos – São Paulo State University – were examined. The shortest anteroposterior length of the mandibular ramus and the distance between the point correspondents to the MF to the deepest portion of the anterior border of the mandibular ramus were obtained using a digital caliper. All the measurements were registered in millimeters. The ratio between the measurements was calculated. The results showed that the anteroposterior location of the MF is, on average, at the medium third of the

mandibular ramus. No statistically significant differences were found between ages of **7**-12 years

Sidney Ricardo Dotto et al [4]evaluated the location of the mental foramen, using panoramic x-rays from children with ages among 10 to 12 years. In children with ages among 10 and 11 years, the percentage occurrence of the mental foramen location was in the inferior third of the alveolar ridge and, in the 12 years age group, it was in the middle third. Authors concluded that the position of the mental foramen modifies with the increase of the age

L BL Prabodha et al [3]also discussed in his article the reasons for age change in the position of the mental foramen. The change in position of the mental foramen could also be influenced by the relative change in position of teeth which could be influenced by eruption of new teeth, migration of teeth due to proximal space loss and extraction and by growth of the mandible . In children before tooth eruption, MF is closer to the superior margin of the body of the mandible and during the eruption period, MF descends to halfway between the superior and inferior margins of the body of the mandible, and in adults with the teeth preserved, the MF is closer to the inferior border of the body of the mandible .With loss of teeth and the alveolar bone resorption the MF moves upwards closer to the superior border of the mandible and in extreme cases of resorption the MF and the adjacent part of the mandibular canal are open at the superior margin of the body of the mandible.

Gender changes of the position of the mental foramen

The distribution of presence of mental foramen on right side of mandible in respective anatomical location across gender was not statistically significant (p-Value > 0.128).Anatomical location of mental foramen was found in line with the apex of the second premolar in 307(61.4%) of which 147 (29.4%) were males and 160 (32%) were females. On the left side, mental foramen was found in line with the apex of the second premolar in 321(64.2%) of which 163 (32.6%) were males and 158 (31.6%) were females. Anatomical location of mental foramen was found situated between the apex of second premolar and first molar in 36(7.2%) of which 19 (3.8%) were males and 17 (3.4%) were females. The distribution of presence of mental foramen on right side of mandible in respective anatomical location across gender was not statistically significant. The p-Value > 0.444.

This is in accordance with the study done by **W. Apinhasmit et al**[12] studied the location of the mental foramen (MF) related to gender and side. The mean distances from the MF to the symphysis menti, to the posterior border of the mandibular ramus, to the lower border of the mandible and to the buccal cusp tip of the second premolar, the mean distances from the alveolar bone crest across the MF to the lower border of the mandible and the mean distance from the buccal cusp tip of the second premolar through the long axis of the clinical crown to the lower border of the mandible were calculated . The values of the three ratios were nearly equal in males and

females and hence there were no gender variations among males and females in this study similar to our study

Shape of the Foramen

In our present study, the shape of the mental foramen was grouped as either round or oval. The distribution of the shape of the mental foramen was analysed across the age groups and gender.Round mental foramen was found in 225(45%) of which 114 (22.8%) were males and 111 (22.2%) were females. Oval mental foramen was found in 275(55%) of which 136 (27.2%) were males and 139 (27.8%) were females. the distribution of the shape of Mental Foramen on the right side of the mandible across gender was not statistically significant (p-Value >0.429). On the left side, Round mental foramen was found in 237(47.4%) of which 122 (24.4%) were males and 115 (23%) were females Oval mental foramen was found in 263(52.6%) of which 128 (25.6%) were males and 135 (27%) were females. The distribution of presence of mental foramen on left side of mandible in respective anatomical location across gender was not statistically significant. p-Value > 0.296.

Flora M Fabian[15] documented the shape of the mental foramen in dry mandibles of adult black Tanzanian population. The shape of the mental foramen was oval in 54% and rounded in 46% of the mandibles. In the article given by **LBL Prabodha et al** [3], following were discussed about the shape of the mental foramen. **Gershenson et al** studied 525 dry mandibles and 50 cadaver dissections and found that MF shape was round in 34.48%

of cases and oval in 65.52% and also **Mbajiorguet al** found different shapes of the MF in the 32 mandibles of adult Black Zimbabweans. There were round and oval Mental foramens in 14 of 32 (43.8%) and 18 of 32 (56.3%) mandibles respectivelly. **Igbigbi and Lebona** studied 70 Malawian mandibles and concluded that the majority of MF was oval in shape. **LBL Prabodha et al** [3]in his study reported the shape of the MF was round in 34.48% of 525 mandibles and oval in shape of 65.52% of cases

Size of the Mental Foramen

The overall Mean size of the mental foramen was 0.29cm. The mean size of the mental foramen in group 1(5-12 years) was 0.242cm. The mean size of the mental foramen in group 2(13-18 years) was 0.296cm.The mean size of the mental foramen in group 3(19-40 years) was 0.333cm.The mean size of the mental foramen in group 4(41-65 years) was 0.305cm.The mean size of the mental foramen in group 5(>65 years) was 0.273cm. The distribution of the Mean Size of Mental Foramen across all age groups was statistically highly significant. p-Value < 0.00.

Previous studies by **LBL Prabodha et al** [3] have reported the size of the mental foramen was at an average of 2.37 mm .In the article given by **LBL Prabodha et al** [3], it was quoted that **Gerherson et al** reported the size of mental foramen as 2.27mm. In the article given by **Gintaras Juodzbalys** [9] stated the study done by **Chung *et* al** who did a comparative morphologic method of analysis starting with photographs of 124 Korean craniums of which 35 were male and 28 females and 71 of unknown sex.

The horizontal opening of the mentonian foramen was 2.4 mm. With **Apinhasmit et al [12]**.the average horizontal opening of the mental foramen was 2.80 ± 0.7 mm. In the article given by **Gintaras Juodzbalys et al [9,]** following studies were quoted. **Phillips *et al*** examined 75 human adult mandibles to determine the size, the orientation, and the position of the mentonian foramen. In accordance with their findings, the foramen, in general, was larger on the left side of the mandible. **Souaga *et al*** studied 61 dry mandibles and reported the average size of the long and the short axis of the foramen were 5.66mm and 3.97mm in the male mandibles. **Neiva et al** found that the mean height of the MF was 3.47 ± 0.71 mm and the mean width was 3.59 ± 0.8 mm after measuring22 Caucasian skulls.

Symmetry of the Mental Foramen

In our present study, Symmetrical mental foramens were found in 417(83.4%) of the patients of which 203(40.6%) were males and 214(42.8%) were females. Asymmetrical mental foramens were found in 83(16.6%) of the patients of which 47(9.4%) were males and 36(7.2%) were females The distribution of the Symmetrical and Asymmetrical Mental foramen of left side as compared with right side across gender was not statistically significant. p-Value>0.229. Previous studies by **KahramanGungor et al[16]** reported that the mental foramen was symmetrical in 90.4% of patients. In this study, the difference of the location of the mental foramen in different ethnics groups was discussed. Contradictory to these findings, **Flora M Fabian[15]** documented symmetry

of the mental foramen in dry mandibles of adult black Tanzanian population. A hundred mandibles were studied. The mental foramen was asymmetrically located between the right and left sides in 78% of the mandibles**.**

Abnormalities of the mental foramen

In our study, there were no abnormalities reported in the assessment of Mental Foramen. In the study done by **Anwar Ramdan et al** [27], following studies were quoted regarding the abnormalities of mental foramen. **Gershenson et al** reported that 4.3% mandibles had double mental foramina, and 0.7% mandibles had triple mental foramina. Finally they found one mandible that had four mental foramina on one side (0.1%). **Serman** examined 408 dry human mandibles and found one extra foramen on one side in seven mandibles constituting 1.7% and in two specimens bilateral double mental foramina. Altogether eleven double mental foramina were documented on 408 mandibular specimens (2.7%). **Sawyer et al** reported 5.9% accessory mental foramen in four ethnic groups and the maximum number found in any population was two. In Thailand **Stithipon** and his colleagues studied 110 mandibles and found only two (1.8%), that had double mental foramina. **Katakami et al** examined 150 patients retrospectively with limited cone-beam computed tomography and depicted 16 double foramina (10.6%) and triple mental foramina on one side(0.6%). **Naitoh et al** studied 157 patients using cone-beam computed tomography and found 11patients that had double on one side (7%) and two(1.2%) that

had triple mental foramina on the contralateral side. **Shankland** showed that 6.62% of the Asian Indians (from 138 mandibles) possessed accessory MF. **Al-Khateeb** observed accessory MF in 10% of the 860 panoramic radiographs obtained from Jordanian populations. **Katakami et al** diagnosed 17 accessory mental foramina's in 16 patients using limited CBCT for 150 patients. Accessory MF tended to exist in the apical area of the first molar and posterior or inferior area of the MF. The accessory branches of the mandibular canal showed common characteristics in the course of gently sloping posterosuperior direction in the buccal surface area.

To summarize the uniqueness of our study, we have examined the Position, size, shape, Symmetry across the age groups and gender. Previous studies have only analysed the position of the mental foramen across gender and age groups. Further in order to standardize the gender and age differences, equal sample size proportions (n=100 for each of the 5 age groups with 50 males and 50 females) were taken. Further an attempt was also made to enable the position of the mental foramen in edentulous mandibles by use of linear measurements and their subsequent comparisons with dentulous mandibles. However further research with advanced investigation methods may enable us to determine various other aspects of mental foramen which can help in clinical applications.

The size, position and symmetry of the mental foramen presents with many variations as influenced by age, sex, race and hence it is important to study these variations in mental foramen so as to apply it in surgical and anesthetic interventions. With this background a cross-sectional Orthopantomographic study titled "Radiographic Evaluation of Mental Foramen" was conducted in the Department of Oral Medicine and Radiology, Ragas Dental College and Hospital to determine the position, shape, size, symmetry and abnormalities of the mental foramen with respect to the age and sex of a hospital based population. Patients within the age group of 5 years and above reporting and referred to the outpatient department of Oral Medicine and Radiology, Ragas Dental College and Hospital were taken into the study group. The total sample size of the study was 500 patients which was equally divided into five age groups (5-12 years,13-18 years,19-40 years,41-65 years and above 65 years) Each of these age groups included equal number of male and female patients. All the radiographic interpretations were carried out in a room with subdued ambient illumination with the help of the radiographic viewer and a magnifying lens to evaluate the position, shape, size, symmetry and abnormalities of the mental foramen. In our study, the position of the mental foramen in edentulous patients was also evaluated by plotting midline reference plane and comparing the linear distance of the mental foramen from the midline. The linear distance comparisons with dentulous mandibles

evaluated the position of the mental foramen with respect to the dentition. The study yielded following results.

1. The anatomical location of mental foramen was found in line with the apex of the second premolar in 307(61.4%) in the right side of the mandible and anatomical location of mental foramen in the left side of the mandible was found in line with the apex of the second premolar in 321(64.2%). The distribution of presence of mental foramen on right side and left side of mandible in respective anatomical location across gender was not statistically significant. The distribution of presence of mental foramen on right and left side of mandible in respective anatomical location across age group was highly statistically significant, p-Value < 0.000.
2. Symmetrical mental foramens were found in 417(83.4%) of the patients and Asymmetrical mental foramens were found in 83(16.6%). The distribution of the Symmetrical and Asymmetrical Mental foramen of left side as compared with right side across gender was not statistically significant. The distribution of presence of mental foramen on right side of mandible in respective anatomical location across age group was statistically significant, p-Value > 0.024.

3. Round mental foramen was found in 237(47.4%) and Oval mental foramen was found in 263(52.6%) on the right side and Round mental foramen was found in 237(47.4%) and Oval mental foramen was found in 263(52.6%) on the left side. The distribution of presence of mental foramen on right and left side of mandible in respective anatomical location across gender was not statistically significant (p-Value > 0.429) (p-Value > 0.296). The distribution of presence of mental foramen on right side of mandible in respective anatomical location across age group was statistically significant, p-Value > 0.033.
4. The overall Mean size of the mental foramen was 0.29cm. The mean size of the mental foramen on the right side in males was 0.296 cm and in females was 0.276cm. The mean size of the mental foramen in the left side was 0.306 cm in males and 0.281 cm in females. The distribution of the Size of Mental Foramen on the right and left side of the mandible across gender was statistically significant, p-Value < 0.00. The distribution of the mean size of Mental Foramen across all age groups was statistically highly significant, p-Value < 0.00.
5. In our study, there were no abnormalities detected in the mental foramens

The study hereby reflects the variations of the mental foramen across age groups and gender on the right and left side of the mandible in a hospital based population. Studying the position and its morphological variations of MF is very important because it will be helpful to localize the important maxillofacial neurovascular bundle passing through the mental foramen and hence plays a very important role in anesthetic, surgical, prosthetic procedures.

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Master Chart Key

1. Position of Mental Foramen

Key	Position
1	Situated at the apex of first deciduous molar
2	Situated at the apex of second deciduous molar
3	Situated anterior to the apex of first premolar
4	In line with the apex of first premolar
5	Between the apex of first and second premolars
6	In line with the apex of second premolar
7	Between the apex of second premolar and first molar
8	In line with the apex of first molar

2. Symmetryof Mental Foramen:

Key	Symmetry of the Mental Foramen
1	Symmetrical
2	Asymmetrical

3. Shape of Mental Foramen

Key	Shape of the Mental Foramen
1	Round
2	Oval

Group 1 (Age 5-12 Years) – Males

Patient Number	Position of the Mental Foramen Right Side	Position of the Mental Foramen Right Side Left Side	Symmetry of Left Side as Compared With Right Side	Size of Mental Foramen Right Side	Size of Mental Foramen Left Side	Shape of Mental Foramen Right Side	Left Side
1	2	2	10	0.2	0.2	13	13
2	2	2	10	0.3	0.3	13	13
3	2	2	10	0.2	0.2	12	12
4	6	5	11	0.3	0.3	12	12
5	2	2	10	0.2	0.2	12	12
6	2	1	11	0.2	0.2	12	12
7	2	1	11	0.2	0.2	12	12
8	4	2	11	0.2	0.3	12	12
9	1	1	10	0.2	0.2	13	13
10	2	2	10	0.2	0.2	13	13
11	2	2	10	0.4	0.4	13	13
12	2	2	10	0.2	0.2	13	13
13	6	6	10	0.4	0.4	12	12

14	1	1	10	0.3	0.3	12	12
15	6	6	10	0.4	0.5	13	13
16	2	2	10	0.2	0.2	13	13
17	2	2	10	0.2	0.2	13	13
18	1	1	10	0.3	0.2	13	13
19	2	2	10	0.2	0.2	13	13
20	1	1	10	0.2	0.2	13	13
21	6	6	10	0.3	0.3	13	13
22	2	2	10	0.2	0.2	13	13
23	2	2	10	0.2	0.2	13	13
24	2	2	10	0.3	0.3	13	13
25	2	2	10	0.2	0.2	12	12
26	6	5	11	0.3	0.3	12	12
27	2	2	10	0.2	0.2	12	12
28	2	1	11	0.2	0.2	12	12
29	2	1	11	0.2	0.2	12	12
30	4	2	11	0.2	0.3	12	12
31	1	1	10	0.2	0.2	13	13
32	2	2	10	0.2	0.2	13	13
33	2	2	10	0.4	0.4	13	13
34	2	2	10	0.2	0.2	13	13
35	6	6	10	0.4	0.4	12	12
36	1	1	10	0.3	0.3	12	12
37	6	6	10	0.4	0.5	13	13
38	2	2	10	0.2	0.2	13	13
39	2	2	10	0.2	0.2	13	13
40	1	1	10	0.3	0.2	13	13
41	2	2	10	0.2	0.2	13	13
42	1	1	10	0.2	0.2	13	13
43	6	6	10	0.3	0.3	13	13
44	2	2	10	0.2	0.2	13	13
45	2	2	10	0.2	0.2	13	13

46	2	2	10	0.3	0.3	13	13
47	2	2	10	0.2	0.2	12	12
48	6	5	11	0.3	0.3	12	12
49	2	2	10	0.2	0.2	12	12
50	2	1	11	0.2	0.2	12	12

Group 1 (Age 5-12 Years) – Females

Patient Number	Position of the Mental Foramen Right Side	Position of the Mental Foramen Left Side	Symmetry of Left Side as Compared with Right Side	Size of Mental Foramen Right Side	Size of Mental Foramen Left Side	Shape of Mental Foramen Right Side	Left Side
1	2	2	10	0.2	0.2	13	13
2	1	1	10	0.3	0.3	12	12
3	2	2	10	0.2	0.2	12	12
4	2	2	10	0.2	0.2	12	12
5	2	2	10	0.3	0.3	13	13
6	2	2	10	0.2	0.3	12	12
7	1	2	11	0.2	0.2	12	12
8	1	1	10	0.2	0.2	12	12
9	6	6	10	0.3	0.3	12	12
10	6	5	11	0.3	0.4	12	12
11	5	5	10	0.2	0.2	13	13
12	2	2	10	0.2	0.2	13	13
13	2	2	10	0.2	0.2	13	13
14	2	2	10	0.2	0.2	13	13
15	6	6	10	0.3	0.3	13	13
16	1	1	10	0.3	0.2	12	12
17	1	1	10	0.2	0.2	13	13
18	2	2	10	0.2	0.2	13	13
19	1	1	10	0.2	0.2	13	13
20	1	1	10	0.2	0.2	13	13

21	6	6	10	0.3	0.3	13	13
22	1	1	10	0.2	0.2	12	12
23	2	2	10	0.2	0.2	13	13
24	1	1	10	0.3	0.3	12	12
25	2	2	10	0.2	0.2	12	12
26	2	2	10	0.2	0.2	12	12
27	2	2	10	0.3	0.3	13	13
28	2	2	10	0.2	0.3	12	12
29	1	2	11	0.2	0.2	12	12
30	1	1	10	0.2	0.2	12	12
31	6	6	10	0.3	0.3	12	12
32	6	5	11	0.3	0.4	12	12
33	5	5	10	0.2	0.2	13	13
34	2	2	10	0.2	0.2	13	13
35	2	2	10	0.2	0.2	13	13
36	2	2	10	0.2	0.2	13	13
37	6	6	10	0.3	0.3	13	13
38	1	1	10	0.3	0.2	12	12
39	1	1	10	0.2	0.2	13	13
40	2	2	10	0.2	0.2	13	13
41	1	1	10	0.2	0.2	13	13
42	1	1	10	0.2	0.2	13	13
43	6	6	10	0.3	0.3	13	13
44	1	1	10	0.2	0.2	12	12
45	2	2	10	0.2	0.2	13	13
46	1	1	10	0.3	0.3	12	12

47	2	2	10	0.2	0.2	12	12
48	2	2	10	0.2	0.2	12	12
49	2	2	10	0.3	0.3	13	13
50	2	2	10	0.2	0.3	12	12

Group 2 (Age 13-18 Years) - Males

Patient	**Position of the mental foramen**		**Symmetry of left**	**Size of**	**Size of**	**Shape of**	
Number			**Side as compared**	**Mental foramen**	**Mental foramen**	Mental foramen	
	Right side	**Left side**	**With right side**	Right side	Left side	Right side	Left side
1	6	6	10	0.4	0.5	12	12
2	6	6	10	0.4	0.5	12	12
3	5	6	11	0.2	0.3	12	12
4	5	5	10	0.4	0.4	12	12
5	6	6	10	0.3	0.3	12	12
6	6	6	10	0.5	0.6	12	12
7	5	6	11	0.3	0.3	13	13
8	6	6	10	0.2	0.2	12	12
9	5	6	11	0.3	0.3	12	12
10	6	6	10	0.4	0.3	12	12
11	6	6	10	0.3	0.3	13	13
12	6	6	10	0.3	0.3	13	13
13	5	6	11	0.3	0.3	12	12
14	6	6	10	0.3	0.3	13	13
15	6	6	10	0.3	0.3	13	13
16	6	6	10	0.2	0.2	13	12
17	6	6	10	0.3	0.3	13	13

18	6	6	10	0.2	0.3	13	13
19	5	5	10	0.2	0.3	13	13
20	6	6	10	0.2	0.2	12	12
21	6	6	10	0.3	0.3	13	13
22	6	6	10	0.3	0.4	13	13
23	6	6	10	0.3	0.4	13	13
24	5	5	10	0.2	0.2	13	13
25	6	6	10	0.4	0.4	12	12
26	6	6	10	0.4	0.5	12	12
27	6	6	10	0.4	0.5	12	12
28	5	6	11	0.2	0.3	12	12
29	5	5	10	0.4	0.4	12	12
30	6	6	10	0.3	0.3	12	12
31	6	6	10	0.5	0.6	12	12
32	5	6	11	0.3	0.3	13	13
33	6	6	10	0.2	0.2	12	12
34	5	6	11	0.3	0.3	12	12
35	6	6	10	0.4	0.3	12	12
36	6	6	10	0.3	0.3	13	13
37	6	6	10	0.3	0.3	13	13
38	5	6	11	0.3	0.3	12	12
39	6	6	10	0.3	0.3	13	13
40	6	6	10	0.3	0.3	13	13
41	6	6	10	0.2	0.2	13	12
42	6	6	10	0.3	0.3	13	13
43	6	6	10	0.2	0.3	13	13

44	5	5	10	0.2	0.3	13	13
45	6	6	10	0.2	0.2	12	12
46	6	6	10	0.3	0.3	13	13
47	6	6	10	0.3	0.4	13	13
48	6	6	10	0.3	0.4	13	13
49	5	5	10	0.2	0.2	13	13
50	6	6	10	0.4	0.4	12	12

Group 2 (Age 13-18 Years) –Females

Patient	**Position of the mental foramen**		**Symmetry of left**	**Size of**	**Size of**	**Shape of**	
Number			**Side as compared**	**Mental foramen**	**Mental foramen**	Mental foramen	
	Right side	**Left side**	**With right side**	Right side	Left side	Right side	Left side
1	6	6	10	0.4	0.4	12	12
2	5	6	11	0.2	0.3	13	13
3	6	6	10	0.3	0.2	12	12
4	5	6	11	0.3	0.3	13	13
5	6	6	10	0.3	0.3	13	13
6	6	7	11	0.4	0.4	12	12
7	6	6	10	0.3	0.3	12	12
8	6	6	10	0.3	0.2	12	12
9	6	6	10	0.2	0.2	12	12

10	6	6	10	0.2	0.2	13	13
11	6	6	10	0.4	0.4	12	12
12	6	6	10	0.3	0.3	12	12
13	5	6	11	0.3	0.2	13	13
14	4	4	10	0.3	0.3	13	13
15	4	4	10	0.3	0.3	13	13
16	7	7	10	0.2	0.2	13	13
17	6	6	10	0.2	0.2	12	12
18	6	6	10	0.2	0.3	13	13
19	6	6	10	0.3	0.3	13	13
20	6	6	10	0.3	0.3	13	13
21	6	5	11	0.3	0.3	13	13
22	6	6	10	0.3	0.3	13	13
23	5	6	11	0.3	0.2	12	12
24	6	6	10	0.2	0.2	12	12
25	6	7	11	0.2	0.3	13	13
26	6	6	10	0.4	0.4	12	12
27	5	6	11	0.2	0.3	13	13
28	6	6	10	0.3	0.2	12	12
29	5	6	11	0.3	0.3	13	13
30	6	6	10	0.3	0.3	13	13
31	6	7	11	0.4	0.4	12	12
32	6	6	10	0.3	0.3	12	12
33	6	6	10	0.3	0.2	12	12
34	6	6	10	0.2	0.2	12	12
35	6	6	10	0.2	0.2	13	13

36	6	6	10	0.4	0.4	12	12
37	6	6	10	0.3	0.3	12	12
38	5	6	11	0.3	0.2	13	13
39	4	4	10	0.3	0.3	13	13
40	4	4	10	0.3	0.3	13	13
41	7	7	10	0.2	0.2	13	13
42	6	6	10	0.2	0.2	12	12
43	6	6	10	0.2	0.3	13	13
44	6	6	10	0.3	0.3	13	13
45	6	6	10	0.3	0.3	13	13
46	6	5	11	0.3	0.3	13	13
47	6	6	10	0.3	0.3	13	13
48	5	6	11	0.3	0.2	12	12
49	6	6	10	0.2	0.2	12	12
50	6	7	11	0.2	0.3	13	13

Group 3 (Age 19-40 Years) –Males

S.No	**Position of the mental foramen**		**Symmetry of left**	**Size of**	**Size of**	**Shape of**	
			Side as compared	**Mental foramen**	**Mental foramen**	**Mental foramen**	
	Right side	**Left side**	**With right side**	**Right side**	**Left side**	**Right side**	**Left side**
1	7	7	10	0.4	0.4	12	12
2	6	6	10	0.3	0.3	12	12
3	6	6	10	0.3	0.3	13	13

4	6	6	10	0.3	0.3	12	12
5	5	5	10	0.4	0.4	12	12
6	6	6	10	0.3	0.3	12	12
7	6	6	10	0.2	0.3	12	12
8	5	6	11	0.5	0.5	12	12
9	5	6	11	0.3	0.3	13	13
10	6	6	10	0.4	0.3	13	13
11	5	6	11	0.3	0.3	13	13
12	6	6	10	0.3	0.3	12	12
13	5	5	10	0.2	0.3	13	13
14	7	7	10	0.4	0.3	13	13
15	6	6	10	0.3	0.2	12	12
16	5	5	10	0.2	0.2	12	12
17	6	6	10	0.2	0.2	12	12
18	6	6	10	0.2	0.2	12	12
19	6	6	10	0.5	0.4	13	13
20	7	7	10	0.3	0.3	13	13
21	5	6	11	0.4	0.6	12	12
22	6	6	10	0.3	0.3	13	13
23	5	6	11	0.2	0.2	12	12
24	5	6	11	0.3	0.4	12	12
25	6	6	10	0.3	0.4	12	13
26	7	7	10	0.4	0.4	12	12
27	6	6	10	0.3	0.3	12	12
28	6	6	10	0.3	0.3	13	13
29	6	6	10	0.3	0.3	12	12

30	5	5	10	0.4	0.4	12	12
31	6	6	10	0.3	0.3	12	12
32	6	6	10	0.2	0.3	12	12
33	5	6	11	0.5	0.5	12	12
34	5	6	11	0.3	0.3	13	13
35	6	6	10	0.4	0.3	13	13
36	5	6	11	0.3	0.3	13	13
37	6	6	10	0.3	0.3	12	12
38	5	5	10	0.2	0.3	13	13
39	7	7	10	0.4	0.3	13	13
40	6	6	10	0.3	0.2	12	12
41	5	5	10	0.2	0.2	12	12
42	6	6	10	0.2	0.2	12	12
43	6	6	10	0.2	0.2	12	12
44	6	6	10	0.5	0.4	13	13
45	7	7	10	0.3	0.3	13	13
46	5	6	11	0.4	0.6	12	12
47	6	6	10	0.3	0.3	13	13
48	5	6	11	0.2	0.2	12	12
49	5	6	11	0.3	0.4	12	12
50	6	6	10	0.3	0.4	12	13

Group 3 (Age 19-40 Years) –Females

S.No	Position of the Mental foramen		Symmetry of left Side as compared	Size of Mental foramen	Size of Mental foramen	Shape of Mental foramen	
	Right side	Left side	With right side	Right side	Left side	Right side	Left side
1	6	6	10	0.4	0.4	13	13
2	7	7	10	0.2	0.3	13	13
3	7	5	11	0.3	0.2	13	12
4	5	5	10	0.4	0.4	13	13
5	6	5	11	0.4	0.5	12	12
6	5	5	10	0.3	0.3	12	12
7	6	6	10	0.3	0.3	13	13
8	6	5	11	0.3	0.2	12	12
9	5	5	10	0.3	0.5	12	12
10	6	6	10	0.3	0.3	12	12
11	5	5	10	0.3	0.3	12	12
12	5	5	10	0.5	0.4	13	13
13	6	6	10	0.3	0.3	13	13
14	6	6	10	0.3	0.3	13	13
15	6	7	11	0.4	0.5	13	13
16	6	6	10	0.2	0.2	12	12
17	5	5	10	0.4	0.4	12	12

18	6	6	10	0.4	0.5	12	12
19	5	6	11	0.5	0.4	13	13
20	5	6	11	0.5	0.4	13	13
21	6	6	10	0.3	0.5	12	12
22	6	6	10	0.3	0.5	12	12
23	6	6	10	0.3	0.5	12	12
24	6	6	10	0.2	0.2	12	12
25	6	6	10	0.3	0.3	13	13
26	6	6	10	0.4	0.4	13	13
27	7	7	10	0.2	0.3	13	13
28	7	5	11	0.3	0.2	13	12
29	5	5	10	0.4	0.4	13	13
30	6	5	11	0.4	0.5	12	12
31	5	5	10	0.3	0.3	12	12
32	6	6	10	0.3	0.3	13	13
33	6	5	11	0.3	0.2	12	12
34	5	5	10	0.3	0.5	12	12
35	6	6	10	0.3	0.3	12	12
36	5	5	10	0.3	0.3	12	12
37	5	5	10	0.5	0.4	13	13
38	6	6	10	0.3	0.3	13	13
39	6	6	10	0.3	0.3	13	13
40	6	7	11	0.4	0.5	13	13
41	6	6	10	0.2	0.2	12	12
42	5	5	10	0.4	0.4	12	12
43	6	6	10	0.4	0.5	12	12

44	5	6	11	0.5	0.4	13	13
45	5	6	11	0.5	0.4	13	13
46	6	6	10	0.3	0.5	12	12
47	6	6	10	0.3	0.5	12	12
48	6	6	10	0.3	0.5	12	12
49	6	6	10	0.2	0.2	12	12
50	6	6	10	0.3	0.3	13	13

Group 4 (Age 41-65 Years) –Males

S.No	**Position of the**		**Symmetry of left**	**Size of**	**Size of**	**Shape of**	
	Mental foramen		**Side as compared**	**Mental foramen**	**Mental foramen**	**Mental foramen**	
	Right side	**Left side**	**With right side**	**Right side**	**Left side**	**Right side**	**Left side**
1	6	6	10	0.3	0.3	13	13
2	5	5	10	0.3	0.3	13	13
3	6	6	10	0.3	0.3	13	13
4	6	6	10	0.5	0.3	12	12
5	6	7	11	0.4	0.5	13	13
6	6	6	10	0.3	0.3	13	13
7	6	6	10	0.5	0.5	13	12
8	6	6	10	0.3	0.4	13	13
9	6	6	10	0.3	0.3	13	13
10	5	5	10	0.2	0.2	13	13

11	6	6	10	0.3	0.3	13	13
12	6	6	10	0.2	0.2	12	12
13	6	6	10	0.3	0.3	12	12
14	6	6	10	0.3	0.3	13	13
15	6	6	10	0.3	0.3	12	12
16	6	6	10	0.3	0.3	12	12
17	6	6	10	0.3	0.3	12	12
18	5	6	11	0.3	0.2	13	13
19	7	7	10	0.3	0.3	13	13
20	5	5	10	0.2	0.2	12	12
21	5	6	11	0.3	0.4	13	13
22	5	6	11	0.2	0.3	13	13
23	6	6	10	0.3	0.3	13	13
24	5	5	10	0.3	0.3	13	13
25	6	6	10	0.3	0.3	13	13
26	6	6	10	0.5	0.3	12	12
27	6	7	11	0.4	0.5	13	13
28	6	6	10	0.3	0.3	13	13
29	6	6	10	0.5	0.5	13	12
30	6	6	10	0.3	0.4	13	13
31	6	6	10	0.3	0.3	13	13
32	5	5	10	0.2	0.2	13	13
33	6	6	10	0.3	0.3	13	13
34	6	6	10	0.2	0.2	12	12
35	6	6	10	0.3	0.3	12	12
36	6	6	10	0.3	0.3	13	13

37	6	6	10	0.3	0.3	12	12
38	6	6	10	0.3	0.3	12	12
39	6	6	10	0.3	0.3	12	12
40	5	6	11	0.3	0.2	13	13
41	7	7	10	0.3	0.3	13	13
42	5	5	10	0.2	0.2	12	12
43	5	6	11	0.3	0.4	13	13
44	5	6	11	0.2	0.3	13	13
45	6	6	10	0.3	0.3	13	13
46	5	5	10	0.3	0.3	13	13
47	6	6	10	0.3	0.3	13	13
48	6	6	10	0.5	0.3	12	12
49	6	7	11	0.4	0.5	13	13
50	6	6	10	0.3	0.3	13	13

Group 4 (Age 41-65 Years) –Females

S.No	**Position of the**		**Symmetry of left**	**Size of**	**Size of**	**Shape of**	
	Mental foramen		**Side as compared**	**Mental foramen**	**Mental foramen**	**Mental foramen**	
	Right side	**Left side**	**With right side**	**Right side**	**Left side**	**Right side**	**Left side**
1	6	6	10	0.3	0.4	13	13
2	6	6	10	0.4	0.4	12	12
3	6	7	11	0.3	0.4	13	13

4	6	6	10	0.3	0.3	13	13
5	6	6	10	0.3	0.3	13	13
6	6	6	10	0.4	0.4	12	12
7	6	6	10	0.3	0.3	13	13
8	6	6	10	0.2	0.2	12	12
9	6	6	10	0.4	0.4	12	12
10	6	6	10	0.3	0.3	12	12
11	6	6	10	0.3	0.3	12	12
12	5	5	10	0.2	0.2	12	12
13	6	6	10	0.2	0.2	12	12
14	6	6	10	0.3	0.2	13	12
15	6	6	10	0.2	0.2	12	12
16	6	6	10	0.3	0.3	13	13
17	5	5	10	0.2	0.2	13	13
18	6	6	10	0.3	0.3	13	13
19	6	6	10	0.4	0.4	13	13
20	6	6	10	0.3	0.3	12	12
21	6	6	10	0.3	0.2	13	13
22	5	6	11	0.3	0.2	13	13
23	6	6	10	0.3	0.4	13	13
24	6	6	10	0.4	0.4	12	12
25	6	7	11	0.3	0.4	13	13
26	6	6	10	0.3	0.3	13	13
27	6	6	10	0.3	0.3	13	13
28	6	6	10	0.4	0.4	12	12
29	6	6	10	0.3	0.3	13	13

30	6	6	10	0.2	0.2	12	12
31	6	6	10	0.4	0.4	12	12
32	6	6	10	0.3	0.3	12	12
33	6	6	10	0.3	0.3	12	12
34	5	5	10	0.2	0.2	12	12
35	6	6	10	0.2	0.2	12	12
36	6	6	10	0.3	0.2	13	12
37	6	6	10	0.2	0.2	12	12
38	6	6	10	0.3	0.3	13	13
39	5	5	10	0.2	0.2	13	13
40	6	6	10	0.3	0.3	13	13
41	6	6	10	0.4	0.4	13	13
42	6	6	10	0.3	0.3	12	12
43	6	6	10	0.3	0.2	13	13
44	5	6	11	0.3	0.2	13	13
45	6	6	10	0.3	0.4	13	13
46	6	6	10	0.4	0.4	12	12
47	6	7	11	0.3	0.4	13	13
48	6	6	10	0.3	0.3	13	13
49	6	6	10	0.3	0.3	13	13
50	6	6	10	0.4	0.4	12	12

Group 5 (>65 Years) –Males

S.No	Position of the Mental foramen		Symmetry of left Side as compared With right side	Size of Mental foramen	Size of Mental foramen	Shape of Mental foramen	
	Right side	Left side		Right side	Left side	Right side	Left side
1	6	6	10	0.4	0.3	12	12
2	6	6	10	0.2	0.2	12	12
3	6	6	10	0.3	0.3	12	12
4	6	6	10	0.3	0.3	12	12
5	6	6	10	0.3	0.3	13	13
6	7	7	10	0.4	0.4	13	13
7	5	6	11	0.3	0.3	12	12
8	6	6	10	0.4	0.5	12	12
9	5	5	10	0.4	0.4	13	13
10	6	6	10	0.3	0.3	12	12
11	6	6	10	0.4	0.4	12	12
12	6	6	10	0.5	0.5	13	13
13	6	7	11	0.2	0.3	13	12
14	6	7	11	0.2	0.2	13	12
15	6	6	10	0.3	0.3	13	13
16	6	6	10	0.3	0.3	12	12
17	6	6	10	0.3	0.3	13	13
18	6	6	10	0.3	0.3	12	12

19	5	5	10	0.3	0.3	13	13
20	6	6	10	0.2	0.2	13	13
21	6	6	10	0.4	0.3	12	12
22	6	6	10	0.2	0.2	12	12
23	6	6	10	0.3	0.3	12	12
24	6	6	10	0.3	0.3	12	12
25	6	6	10	0.3	0.3	13	13
26	7	7	10	0.4	0.4	13	13
27	5	6	11	0.3	0.3	12	12
28	6	6	10	0.4	0.5	12	12
29	5	5	10	0.4	0.4	13	13
30	6	6	10	0.3	0.3	12	12
31	6	6	10	0.4	0.4	12	12
32	6	6	10	0.5	0.5	13	13
33	6	7	11	0.2	0.3	13	12
34	6	7	11	0.2	0.2	13	12
35	6	6	10	0.3	0.3	13	13
36	6	6	10	0.3	0.3	12	12
37	6	6	10	0.3	0.3	13	13
38	6	6	10	0.3	0.3	12	12
39	5	5	10	0.3	0.3	13	13
40	6	6	10	0.2	0.2	13	13
41	6	6	10	0.4	0.4	12	12
42	6	6	10	0.5	0.5	13	13
43	6	7	11	0.2	0.3	13	12
44	6	7	11	0.2	0.2	13	12

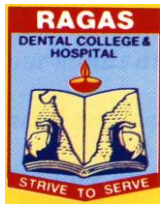
45	6	6	10	0.3	0.3	13	13
46	6	6	10	0.3	0.3	12	12
47	6	6	10	0.3	0.3	13	13
48	6	6	10	0.3	0.3	12	12
49	5	5	10	0.3	0.3	13	13
50	6	6	10	0.2	0.2	13	13

Group 5 (>65 Years) –Females

S.No	**Position of the**		**Symmetry of left**	**Size of**	**Size of**	**Shape of**	
	Mental foramen		**Side as compared**	**Mental foramen**	**Mental foramen**	**Mental foramen**	
	Right side	**Left side**	**With right side**	**Right side**	**Left side**	**Right side**	**Left side**
1	6	6	10	0.2	0.2	13	13
2	6	6	10	0.3	0.3	13	13
3	5	5	10	0.2	0.2	12	12
4	6	6	10	0.3	0.3	12	12
5	6	6	10	0.2	0.2	12	12
6	5	6	11	0.2	0.3	12	12
7	6	6	10	0.2	0.2	13	13
8	6	6	10	0.2	0.2	13	13
9	6	6	10	0.3	0.3	12	12
10	6	6	10	0.2	0.2	13	13
11	6	6	10	0.2	0.2	13	13

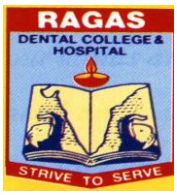
12	6	6	10	0.2	0.2	13	13
13	6	6	10	0.3	0.3	12	12
14	6	6	10	0.2	0.2	13	13
15	6	6	10	0.2	0.2	13	13
16	6	6	10	0.3	0.2	13	13
17	6	6	10	0.3	0.3	12	12
18	7	7	10	0.2	0.2	12	12
19	6	6	10	0.2	0.2	13	13
20	5	5	10	0.3	0.3	13	13
21	6	6	10	0.2	0.2	13	13
22	6	6	10	0.2	0.2	13	13
23	6	6	10	0.2	0.2	13	13
24	6	6	10	0.3	0.3	12	12
25	6	6	10	0.2	0.2	13	13
26	6	6	10	0.2	0.2	13	13
27	6	6	10	0.3	0.2	13	13
28	6	6	10	0.3	0.3	12	12
29	7	7	10	0.2	0.2	12	12
30	6	6	10	0.2	0.2	13	13
31	6	6	10	0.2	0.2	13	13
32	6	6	10	0.2	0.2	13	13
33	6	6	10	0.2	0.2	13	13
34	6	6	10	0.3	0.3	12	12
35	6	6	10	0.2	0.2	13	13
36	6	6	10	0.2	0.2	13	13
37	6	6	10	0.3	0.2	13	13

38	6	6	10	0.3	0.3	12	12
39	7	7	10	0.2	0.2	12	12
40	6	6	10	0.2	0.2	13	13
41	5	5	10	0.3	0.3	13	13
42	6	6	10	0.2	0.2	13	13
43	6	6	10	0.2	0.2	13	13
44	6	6	10	0.2	0.2	13	13
45	6	6	10	0.3	0.3	12	12
46	6	6	10	0.2	0.2	13	13
47	6	6	10	0.2	0.2	13	13
48	6	6	10	0.3	0.2	13	13
49	6	6	10	0.3	0.3	12	12
50	7	7	10	0.2	0.2	12	12



SL.NO. : **OP NO. :** **DATE :** **NAME :** **AGE / SEX :**

Position	**Anatomic position of mental foramen**	**Presence of mental foramen in opg**		**Symmetry of left side as compared with right side**		**Size of mental foramen**		**Shape of mental foramen**		**Abnormality**	
		Right side	**Left side**	**Symm--etrical**	**Asymm--etrical**	**Right side**	**Left side**	**Right side**	**Left side**	**Right side**	**Left side**
1.	Situated at the apex of first deciduous molar										
2.	Situated at the apex of second deciduous molar										
3.	Situated anterior to the apex of first premolar										
4.	In line with the apex of first premolar.										
5.	Between the apex of first and second premolars										
6.	In line with the apex of second premolar										
7.	Between the apex of second premolar and first molar										
8.	In line with the apex of first molar.										



RAGAS DENTAL COLLEGE & HOSPITAL

2/102, East Coast Road, Uthandi, Chennai - 600119

DEPARTMENT OF ORAL MEDICINE & RADIOLOGY

CASE SHEET PROFOMA

A. General information.

DATE:

S.NO:

O.P. NO:

1. Name:
2. Age:
3. Sex: a. Male b. Female:
4. Occupation:

a. Unemployed

b. Professional

c. Administration

d. Trade/Business

e. Student

5. Address:

6. Income;

a. <Rs. 1,000/month

b. b. >1,000-5,000/month

c. c. >5,000/month

B.Past Dental history.

History of previous orthodontic treatment.

History of extraction.

History of periodontal treatment.

C. Intra oral examination:

Decay:

Missing:

Filled:

Mobility:

D. Investigation:

Orthopantamogram.

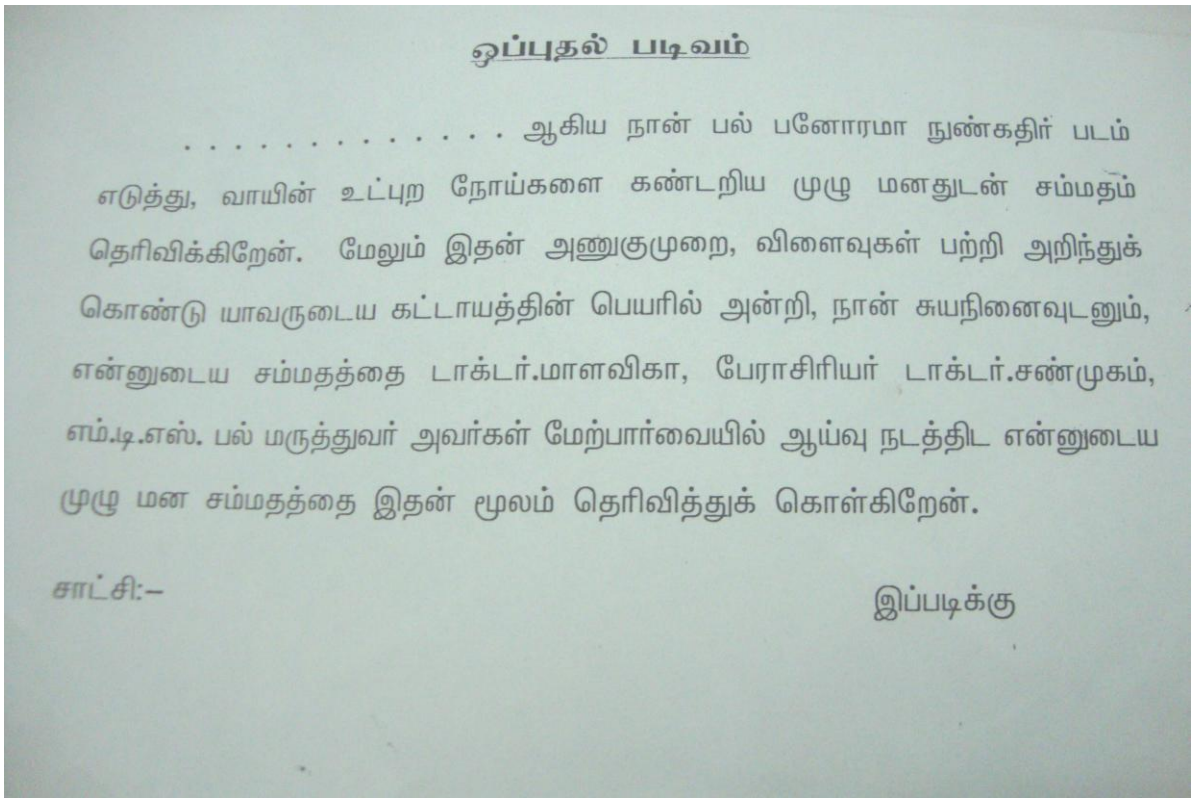
CONSENT LETTER

I ---------- , the under signed hereby give my consent for the performance of taking OPG on myself to evaluate the position of mental foramen, conducted by Dr.R.Malavika, under the guidance of Dr.S.Shanmugam.MDS, Professor and Head Department of Oral Medicine and Radiology, Ragas Dental College and Hospital, Chennai. I have been informed and explained about the evaluation procedure, risk involved and likelihood of successes. I also understand and accept this as a part of study protocol, thereby voluntarily, unconditionally freely give my consent without any fear or pressure in mentally sound, conscious state to participate in the study.

Witness/Representative **Patient signature**

(If any) Date:

ஒப்புதல் படிவம்



ஒப்புதல் படிவம்

. . . . . ஆகிய நான் பல் பனோரமா நுண்கதிர் படம் எடுத்து, வாயின் உட்புற நோய்களை கண்டறிய முழு மனதுடன் சம்மதம் தெரிவிக்கிறேன். மேலும் இதன் அணுகுமுறை, விளைவுகள் பற்றி அறிந்துக் கொண்டு யாவருடைய கட்டாயத்தின் பெயரில் அன்றி, நான் சுயநினைவுடனும், என்னுடைய சம்மதத்தை டாக்டர்.மாளவிகா, பேராசிரியர் டாக்டர்.சண்முகம், எம்.டி.எஸ். பல் மருத்துவர் அவர்கள் மேற்பார்வையில் ஆய்வு நடத்திட என்னுடைய முழு மன சம்மதத்தை இதன் மூலம் தெரிவித்துக் கொள்கிறேன்.

சாட்சி:–

இப்படிக்கு